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**THE TIME WAS RIGHT
FOR STANDARDIZING
THE ARCHIVE LANDSCAPE**

**NO ISLANDS, BUT A UNIVERSAL
ARCHIVE WAS THE SOLUTION.**

ARKADIUSZ DRAG, UNIVERSITY HOSPITAL BONN



One PACS is Not Enough

University Hospital Bonn Expands Radiological Image Management to a Hospital-Wide Universal Archive.

The University Hospital Bonn (UKB) has standardized its entire image management across the hospital and established an electronic universal archive with DeepUnity eVNA. All departments have access to all image and report data through a sophisticated authorization concept.

In 2009, the UKB replaced its existing image data management solution PACS from Dedalus.

“ Our Department of Diagnostic and Interventional Radiology wanted to establish comprehensive digital workflows, which was not possible with the old solution. Therefore, a professional system was needed ”

says Heiko Niggemeier, the team leader for image data management in the Department of Medical Applications and the PACS2 project manager, explaining the reasons for the switch.

Universal Instead of Isolated Solution

What began as an isolated solution for radiology and proved successful there promised potential: namely, connecting other clinics to the PACS and offering them the possibilities of digital workflows. Thus, the PACS2 project was born, which involved the creation of a hospital-wide universal image data archive, also known as a Vendor Neutral Archive (VNA). The demand in other clinics was significant.

“ Data was usually stored on CDs or USB hard drives, decentralized and hard to access.

“ The time was ripe for standardization ”

explains Arkadiusz Drag, Deputy Team Leader of Image Data Management in the Department of Medical Applications, describing the initial situation.

UKB chose to continue with Dedalus and the new PACS, DeepUnity eVNA, for several reasons. Firstly, there were consistently good experiences with the company and its PACS. Secondly, Dedalus also provides the hospital information system (HIS) ORBIS and the enterprise content management system (ECM) HYDMedia.

“ Since the VNA must interact with both, it made sense to stay within one system cosmos to ensure seamless integration without interfaces ”

says Niggemeier.

Moreover, the VNA was not only supposed to store image and report data but also biosignal data, such as EEG or EKG data.

“ At the time of the decision, only Dedalus offered this, along with a special viewer for motion pictures ”

emphasizes Drag.





Integration of All Special Clinics

Today, the UKB is on the brink of a comprehensive VNA. In addition to endoscopy, cardiology (including adult cardiology, cardiac surgery, and pediatric cardiology), and surgery, the entire OR image management is integrated. This allows the surgeon in the operating room to access all images and reports, including external reports, and to integrate modalities like ceiling cameras or endoscopy towers intraoperatively.

“ So far, we have connected more than 400 modalities to the PACS, with the trend rising ”
says Niggemeier, pointing to a flood of mobile devices.

“ Surgeons and doctors in outpatient clinics are increasingly using portable ultrasound devices that they connect to their smartphones or tablets and, of course, want to save the results ”

explains the team leader for image data management. The last clinic to be connected will be pathology.

With great commitment and the support of their partner, they also managed to integrate “exotic” fields like ophthalmology and dentistry into the VNA. After workflow analysis and many discussions with doctors and nursing staff, a corresponding specialty concept was developed, which Dedalus implemented.

Overcoming All Hurdles

How do you involve the affected professional groups in such a change process?

“First, we formed interdisciplinary teams in the individual clinics and, together with them, developed the specialty concepts. Before that, we closely examined the on-site processes. Then we spent a lot of time conveying the advantages to the users. We discussed with chief physicians, attended morning meetings, and went to workstations. This allowed us to identify efficiency potentials and demonstrate that users save time and have faster access to images and reports, even across clinics ”

Niggemeier recalls the process.

Primarily, doctors on the wards benefit from the described access. They can jump from the HIS into the patient's file and view all of their patient's images. If a patient with leg pain comes to the outpatient clinic and the treating physician suspects a neurological problem, they can grant access to the image data to their specialist colleague and immediately hold a consultation. To accommodate all conceivable scenarios, the UKB, in consultation with the data protection officer, developed a very complex authorization concept. Every doctor can see the images taken in their department, imported external images, and the images created at their request. To ensure the best possible care without time delays, images can also be made available to other clinics for joint treatment. A classic example is interdisciplinary tumor boards. In emergencies, images can also be manually released.

“ This authorization concept could only be implemented with Dedalus HealthCare ”

emphasizes Drag.

“ The metadata of each image indicates where it was taken and which clinic it belongs to. Thus, it is clear who can see it. This feature and enabling other clinics to access are significant advantages of DeepUnity eVNA. ”



Goal: eVNA

The consolidation of the individual departmental archives into the VNA proved more complex than expected. On one hand, many data in proprietary formats had to be made DICOM-compatible; on the other hand, the sometimes considerable data volumes—terabytes accumulated over years and decades—consumed valuable time during migration.

“At times, this went so far that the data had to be manually linked with a worklist and thus assigned to the patient ”

says Drag with horror.

In total, more than 350 terabytes of old data were migrated, with additional data from pathology amounting to several petabytes (about 1,000 terabytes or 10^{15} bytes). Therefore, the UKB is considering outsourcing it to the cloud.

“ It is hardly possible to physically maintain these immense data volumes on-site anymore. After all, we must renew the entire infrastructure every four to five years, which is very costly ”

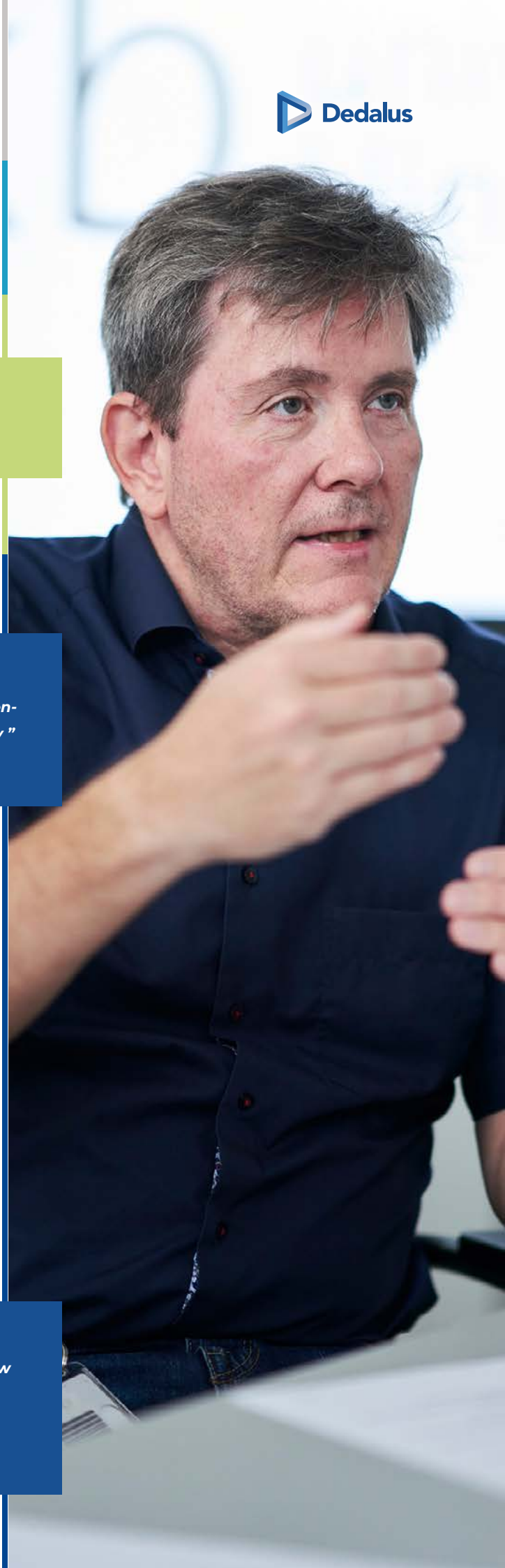
Niggemeier explains the considerations.

In addition to the universal archive, the University Hospital also operates a test archive, an import archive, a research archive, and a migration archive. The first is used for testing new versions, updates, etc. The clinics use the import archive to implement the central concept of integrating external data. There, recordings of patients coming to the clinic for examination are stored. If they are admitted for further treatment, the Data Manager, a special PACS tool, automatically links the recordings with the patient ID and transfers them to the VNA. The study archive, finally, is a separated part within the VNA with a separate authorization concept so that only the employees involved in a study have access to the data explicitly released by the patients beforehand.

The introduction of the DeepUnity eVNA Viewer—an overarching VNA viewer for DICOM and non-DICOM formats—will close the centralization of all archives at our University Hospital.

“ All document formats will be unified, whether proprietary formats, DICOM images, or PDF and Word files. Users can view all data with a universal viewer, allowing them to exchange information intersectorally ”

explains Heiko Niggemeier.





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