



**Dedalus**

**THE TIME HAD COME TO  
STANDARDIZE THE  
ARCHIVING LANDSCAPE.**

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

**ARKADIUSZ DRAG (LEFT), 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 has standardized its entire image management across the hospital and established an electronic universal archive with DeepUnity. With this, all departments have access to all image and report data through a sophisticated authorization concept.

In 2009, the University Hospital Bonn (UKB) replaced its existing image data management solution (PACS) with Dedalus HealthCare's IMPAX EE.

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

says Heiko Niggemeier, team lead for Image Data Management in the Department of Medical Applications and PACS2 project manager, explaining the reasons for the switch.



## A universal instead of an isolated solution

What started as an isolated solution for radiology and proved successful there, promised potential: namely, connecting also 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 had come for standardization, ”***

explains Arkadiusz Drag, deputy team lead of Image Data Management in the Department of Medical Applications, describing the initial situation.

UKB chose to continue its path with Dedalus HealthCare and the new PACS DeepUnity for several reasons. Firstly, we've consistently had good experiences with the company and its PACS. Secondly, the Bonn-based provider also offers 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 ECG data.

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





## Integration of all specialist hospitals

Today, the UKB is on the threshold of a comprehensive VNA. In addition to endoscopy, cardiology (including adult cardiology, cardiac surgery and pediatric cardiology), and surgery, the entire surgical 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, and the number is growing,”*** says Niggemeier, pointing to a plethora of mobile devices.

***“Surgeons and doctors in outpatient departments are increasingly using portable ultrasound devices that they connect to their smartphones or tablets and of course they want to store the results,”*** explains the team lead for Image Data Management.

One of the last clinics 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 a workflow analysis and many discussions with physicians and nursing staff, a corresponding technical concept was developed, which Dedalus HealthCare implemented.

However, it was not only technical challenges that had to be overcome during the project. It was at least as important to get the users on board and to ensure that they would later find their way around the PACS and its workflows. “Physicians and nursing staff have had their well-established processes for many years. And we realized that there are clinics whose workflows we cannot map in a radiology-oriented PACS. For example, we left the departmental systems to cardiology, ophthalmology and dentistry because they have specific tools that they need for their daily work. However, archiving takes place in the universal archive,” says Drag. Although this path was accompanied by hurdles and was paved with interfaces, with a little effort it led to a high level of employee satisfaction.

## 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 then, together, we developed the technical concepts. Before that, we closely examined the processes on-site. Then we spent a lot of time conveying the advantages to the users. We talked to chief physicians, attended morning meetings, and went to workstations. This allowed us to identify efficiency potentials and show that users save time and have faster access to images and reports, even across clinics, ”***

Niggemeier recalls the process.

The described access primarily benefits physicians at workstations. They can switch from the HIS into the patient's file and view all of their patient's images. If a patient comes to the outpatient clinic with leg pain and the attending physician suspects a neurological problem, they can give a specialized colleague access to the image data and hold a consultation directly. To accommodate all conceivable scenarios, the UKB developed a very complex authorization concept in consultation with the data protection officer. Every physician can see the images taken in their department, imported external images and images created at their request. To ensure the best possible care without delays, images can also be made available to other clinics for joint treatment. Interdisciplinary tumor boards are a classic example for this. In emergencies, images can also be shared manually.

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

emphasizes Drag.

***“ It is stored in the metadata of each image where it was recorded and to which clinic it belongs. Thus, it is clear who can see it. This feature and giving access to other clinics are significant advantages of DeepUnity. ”***





## 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.

***“In some cases, the data had to be manually linked to 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 anymore to physically maintain these immense data volumes on-site. Ultimately, we have to renew the entire infrastructure every four to five years, which is very costly,”***

says Niggemeier, explaining 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 procedures are stored. If they are admitted for further treatment, the Data Manager, a special PACS tool, automatically links the records with the patient ID and transfers them to the VNA. Finally, the study archive is a separated part within the VNA with a separate authorization concept, so that only employees involved in a study have access to the data explicitly released by the patients beforehand.

The next step will be to introduce the new DeepUnity Viewer - as comprehensive VNA viewer for DICOM and non-DICOM formats.

***“This will complete the centralization of all archives at our University Hospital. All document formats, whether they are proprietary formats, DICOM images, or PDF and Word files, will be unified. Users can view all data with a universal viewer, allowing them to exchange information across sectors,”***

explains Heiko Niggemeier.





## From Users for users

### Bonn University Hospital

- Maximum care hospital
- 38 clinics and 31 institutes
- 1,350 beds
- Around 350,000 outpatient, 50,000 inpatient and 40,000 emergency patients per year

***“ With the VNA, users save time and have faster access to images and findings, even across clinics. ”***

Heiko Niggemeier University Hospital Bonn





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