


The Philips logo is displayed in a white rounded rectangle on a dark blue background. The word "PHILIPS" is written in a bold, blue, sans-serif font.

Image guided therapy

**Azurion**

A photograph of a medical professional in a surgical suite. The professional is wearing a purple surgical cap, a light blue face mask, and a teal sterile gown. They are positioned next to a large white Philips Azurion image-guided therapy system. A patient is lying on a table, partially covered with a blue sterile drape. The background shows other medical equipment and monitors in a clinical setting.

**Reduction of procedure time by 17%**  
with Philips Azurion  
in independently verified study

## The ability to treat one more patient per day today, or in the future

More than ever, hospitals must deliver measurable improvements in quality, efficiency, care continuity and cost reduction. The pace and complexity of technology change makes definitive decisions around capital spending to support these improvements even more difficult.

St. Antonius Hospital, a leading interventional institution, has delivered exemplary patient care for decades. They are recognized for their longstanding commitment to continuously improving the quality and efficiency of their healthcare services. However, increasingly complex procedures, unpredictable demand, and growing patient waiting time prompted them to look for ways to make more impactful clinical and operational improvements in their interventional labs. When the time came to replace one of their existing labs, their goal was to invest in a solution that would help them 1) improve quality of care, 2) maximize workflow efficiency, and 3) drive staff and patient satisfaction.

Azurion is the new-generation image guided therapy platform from Philips. St. Antonius was among the first hospitals world-wide to install the Philips Azurion suite. They participated in a comprehensive study to evaluate the impact of the new platform and its clinical workflow on their department.

Study results were verified by NAMSA, an independent third-party expert on study design and analytics, and revealed that St. Antonius achieved statistically significant improvements in workflow using Azurion. Optimizing in-lab patient preparation time, procedure time and post-procedure lab time enabled the hospital to treat more patients and achieve greater staff and patient satisfaction.

The key results are shown below. Read on to find out how these results were achieved.

### Who

Interventional Vascular Department  
St. Antonius Hospital, Utrecht/  
Nieuwegein, The Netherlands

### Challenge

Improve operational and clinical efficiency in the interventional suite while maintaining high quality care and staff satisfaction

### Key results

The Philips Azurion system enabled the hospital to achieve:

- **12% reduction** in patient preparation time
- **17% reduction** in procedure time
- **28% reduction** in post-procedure lab time
- **25% reduction** in planned cases finished late
- **The ability to treat 1 more patient per day**

# From innovative design to economic proof



## A partnership to shape the future

St. Antonius is a leading teaching hospital in central Netherlands with a strong focus on research and training. It offers a wide range of medical specialties and is known nationally for its cardiovascular expertise. St. Antonius runs operations from three different locations and treats more than 93,000 patients annually. Like many hospitals, St. Antonius is challenged with an unpredictable patient demand and increasing cost pressures. When choosing a new interventional suite, they turned to Philips as an innovative and trusted partner to help them enhance patient care and implement changes to support their long-term interventional strategy.

## Building economic proof

Improving the efficiency and quality of interventional procedures have been key drivers for Philips since creating the first interventional suites. Throughout the development of the Azurion system, Philips performed iterative feedback cycles with users to test and refine its new, more flexible workflow approach. Prior to launch, a study was conducted with clinical users in a simulated environment to evaluate the enhanced usability and workflow with impressive results<sup>1</sup>.

Finally, the Azurion system was installed at first-of-kind sites to closely monitor the system in clinical use. But did these innovations and iterations translate into *economic proof* of the impact of the Azurion system during everyday use? To prove this, Philips partnered with North American Science Associates, Ltd. (NAMSA), an internationally recognized leader in medical device-focused biostatistics, on a comprehensive study before and after installation of the new Azurion lab in St. Antonius Hospital. The study was designed to demonstrate the extent to which the system's new user interface and advanced workflow led to a more efficient operation of the interventional suite.

## Study design

To establish a baseline, detailed data was collected on all interventional exams in the existing lab for 8 months prior to the installation of Azurion. Timestamping tablets installed inside and outside the lab enabled hospital staff to record relevant procedure metrics and disturbance variables with minimal effort. In parallel, the Philips team conducted observations and interviews with key stakeholders including physicians, lab staff, and administrators to determine their current workflow state. In addition, a CenTrak real-time location system was installed within the exam room, control room, supply areas and hallways to measure communication and staff movement.

## After installing Azurion, the interventional vascular department of St. Antonius Hospital achieved a:

- 12% reduction in patient preparation time
- 17% reduction in procedure time
- 28% reduction in post-procedure lab time
- 25% reduction in planned cases finished after normal working hours
- 29% reduction in staff movement between exam and control room
- 44% increase in usage of supporting software tools
- 77% usage of instant parallel working to increase workflow efficiency

### Training to enhance knowledge retention

Prior to installation of the system, Philips evaluated the training requirements of the hospital staff and developed an education curriculum tailored to their specific needs. Training was delivered based on a methodology focused on maximizing knowledge retention. Armed with data from the comprehensive pre-measurement phase, the staff learned not just system functionality but also how system features could optimize workflow within their lab. After installation of the Philips Azurion suite and the training period, data collection began again on the same procedure-related metrics as well as new metrics related to the use of the Azurion system. Procedure mix and types, staff, materials and other variables were similar to the pre-measurement phase.

### Independent 3rd Party Verification

To verify study results, NAMSA conducted a series of statistical tests and concluded that the comparison of department data before and after Azurion installation resulted in *statistically significant improvements* for St. Antonius in the areas of in-lab patient preparation, procedure time, post-procedure lab time, after-hours work, and staff movement.

## Why is statistical significance important?

Statistical significance refers to whether any differences observed between groups being studied are reliable or whether they are simply due to chance. Mathematical formulas are used to examine differences in outcomes between the groups and result in a “p-value” to describe the probability of observing a difference purely by chance in two groups of exactly-the-same people. Mathematical probabilities like p-values range from 0 (not by chance) to 1 (chance).

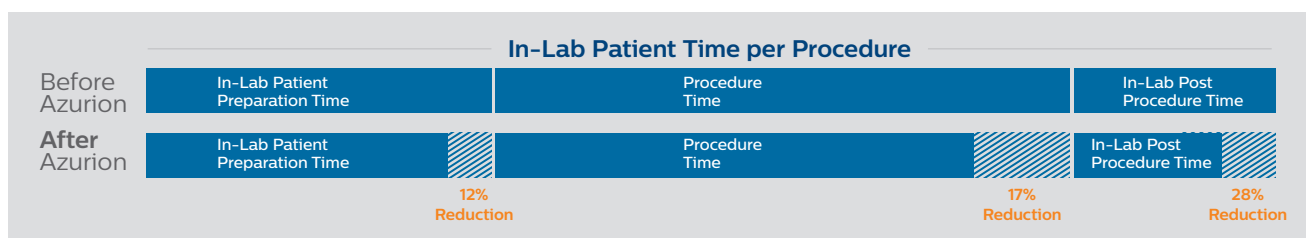
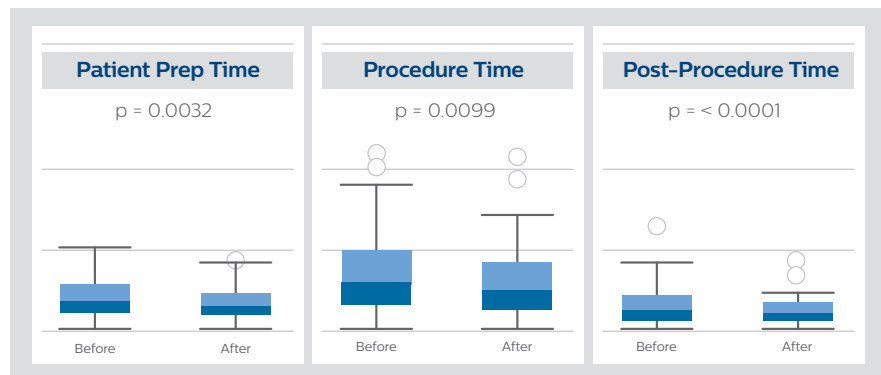
A p-value of 0.05 means there is a very good chance — 95 per cent — that the difference in outcomes was not due to chance. If it is unlikely enough that the difference in outcomes occurred by chance alone, the difference is pronounced “statistically significant.”

Procedure time decreases in the St. Antonius workflow study had p-values of < 0.01 and are considered statistically significant.

### Statistically significant workflow improvements using Azurion verified by independent 3<sup>rd</sup> party

#### Study Detail

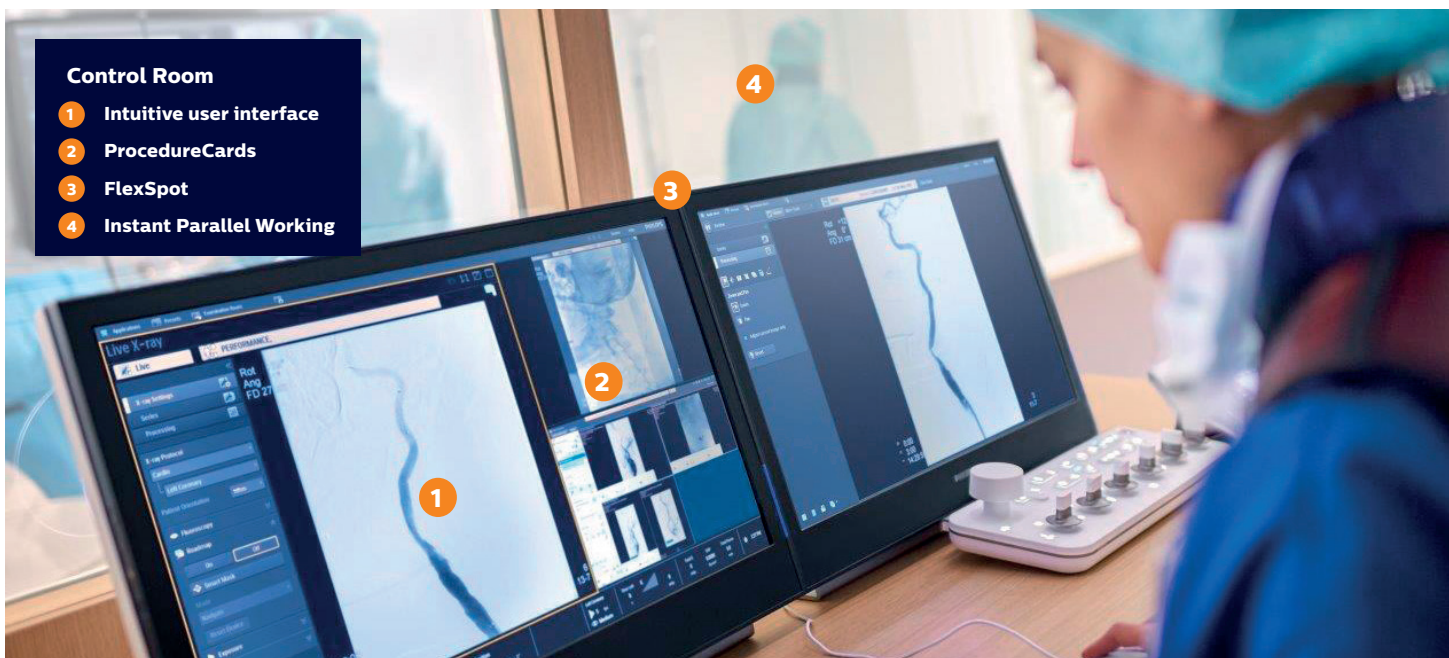
- 775 procedures
- 12 x-ray techs
- 6 physicians
- independent 3<sup>rd</sup> party verification
- p-values < 0.01





# Results: efficiency and excellent care throughout the patient journey

To maximize workflow efficiency, St. Antonius had the goals of reducing unnecessary patient wait time, improving lab utilization and achieving greater consistency in the performance of non-emergency procedures. The study results showed that the combination of Azurion's new hardware platform, flexible workflow approach and enhanced training delivery led St. Antonius to impressive improvements in efficiency and patient care across procedure types. These improvements had a positive effect on both patients and clinical staff throughout the patient journey. Performance was measured in three main categories; patient preparation, procedure, and post-procedure.



## 12% reduction of in-lab patient preparation time

In-lab patient preparation begins when the patient is brought into the lab, and ends when arterial access is gained. After installing Azurion, the interventional vascular department at St. Antonius showed a **reduction in in-lab patient preparation time of 12%**. A contributor to the improvement was the use of ProcedureCards.

**ProcedureCards** are digital cards containing pre-defined settings (including customized screen layouts for both exam room and control room), X-ray imaging parameters, and patient orientation for specific interventional procedures and users. At St. Antonius, hospital-specific clinical protocols and checklists, such as the department's lab Time Out Procedure, were integrated into the ProcedureCards, reducing variability and ensuring the right documents were connected to specific procedures. Displaying this information on screen in the exam or control room further standardized workflow. One-click set up reduced patient preparation time and helped minimize preparation errors.

## 17% reduction in procedure time

St. Antonius physicians perform a wide variety of complex interventional procedures. A system with intuitive workflow and easy-to-use controls to capture and manipulate clinical images can lead to shorter procedure times and result in more accurate patient scheduling blocks. Procedure time is defined as time when arterial access is gained until sheath removal. After installing Philips Azurion, the interventional vascular department of St. Antonius hospital showed a **reduction in procedure duration of 17%**.

Azurion's **intuitive user interface** facilitated all three aspects of interventional workflow; efficiency, consistency and user interaction. An extensive user-centric design process ensured that the user interface would be easy to learn, use and remember. This intuitive workflow promoted steady and smooth movement through cases, improving efficiency and consistency by making it easier to see the information staff needed, when they needed it. One combined control module with one-button-one-function operation and backlit icons allowed physicians and radiographers to fully concentrate on the procedure rather than system navigation.



### Examination Room

- 1 FlexVision Pro
- 2 TSM Pro
- 3 Intuitive user interface

Clinical staff were able to configure unlimited screen layouts - even during procedures - using their high-resolution 58-inch LCD **FlexVision Pro** screen in the exam room.

With a single wireless mouse, clinical staff had full and flexible control of all connected applications, including PACS. Image capture with a single click, re-sizing of live images, measurements were also performed at tableside.

Software tools designed to improve efficiency and image guidance were also easily accessed with the FlexVision Pro.

The **Touch Screen Module Pro (TSM Pro)** enabled St. Antonius lab staff to pinch, zoom, pan and flag images for processing, collimate on a clinical image with one finger, and store and recall system positions with easy, tablet-like navigation. With the flexibility to view clinical images at the side or foot of the table, less bending and stretching was required for radiographers to see around drip stands and other lab equipment.

Within the control room, the fully-integrated **FlexSpot** gave interventional lab staff effortless access to all connected applications (including external sources), with one mouse and keyboard eliminating the need to switch between different applications and workstations.



“The flexibility of the system enables us to easily make adjustments and work according to the personal preferences of the physician. We can pre-program these preferences in the ProcedureCards, so with one-click the system is ready to start the procedure according to their preferred way of working.”

Pauline Vernooij, Interventional Technologist, St Antonius Hospital, Utrecht/Nieuwegein, the Netherlands.

Microbes in the air of the operating room or interventional lab can be an important source of pathogens resulting in wound infections. Limiting traffic in the treatment area is essential to reducing airborne bacteria. Literature shows that sterility is directly related to the amount of movement between exam and control room<sup>2,3</sup>. By allowing full tableside control, Azurion's **FlexVision Pro** and **TSM Pro** solutions reduced the necessity of team members moving in and out of the sterile area during procedures.

Philips used the location data captured in both the pre- and post-installation phases to quantify how the use of these features decreased unnecessary movement of physicians and nurses between the exam room and control room and saved procedure time. After installing Azurion in the interventional vascular department of St. Antonius, **staff movement between the exam room and control room was reduced by 29%** as shown in Figure 1.

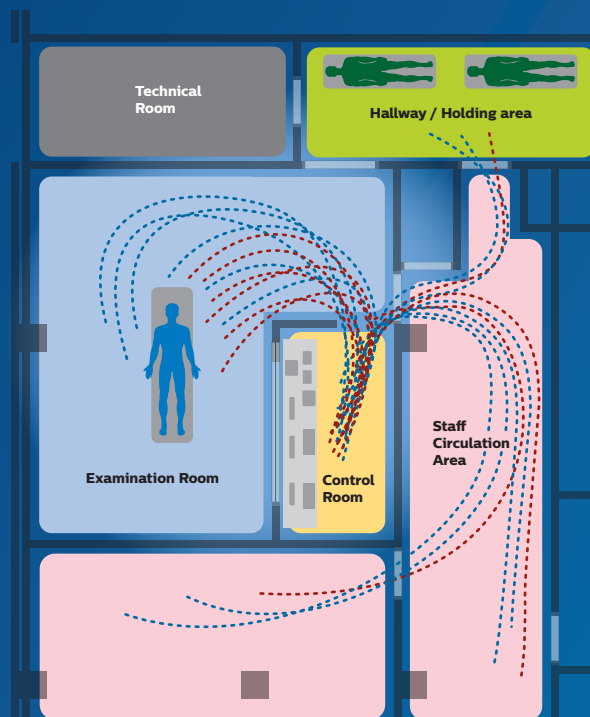
### 28% reduction in post-procedure lab time

Longer than necessary post-procedure activities delay the start of the next procedure and contribute to patient wait time. Post-procedure measurement starts with sheath removal and ends when the patient leaves the exam room. After installing Philips Azurion, the interventional department at St. Antonius showed a **reduction in post-procedure lab time of 28%**.

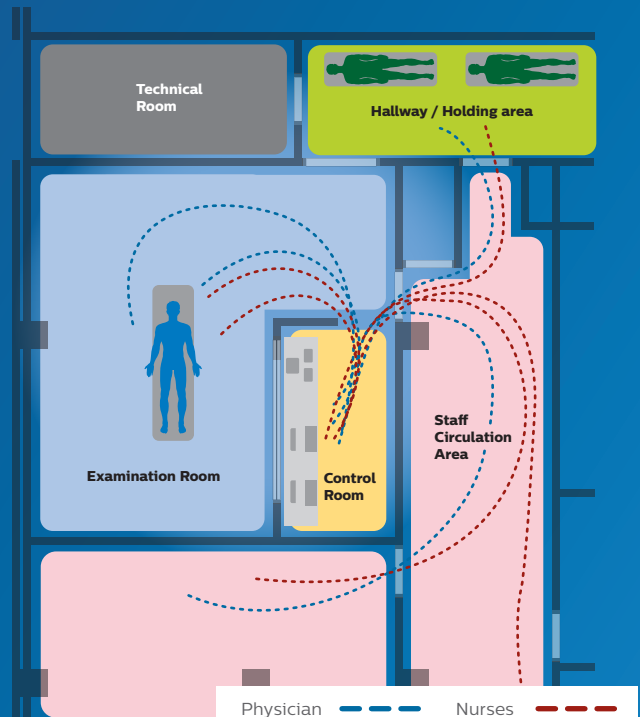
Through the **Instant Parallel working** function, used in 77% of exams, the Azurion system allowed interventional lab staff to work independently and together in the exam room and control room, without interrupting each other or waiting on a team member to finish a task. Clinical staff in St. Antonius could review patient information, review and process past and current images, and perform quantitative analysis without impacting the live case. The department also increased usage of the 2D-QA tool by 44%. Hospital staff noted higher throughput and faster exam turnover without compromising quality of care.

Figure 1

### Pre-staff movement



### Post-staff movement



Visit [www.philips.com/labperformance](http://www.philips.com/labperformance) in order to view the staff movements in more detail.





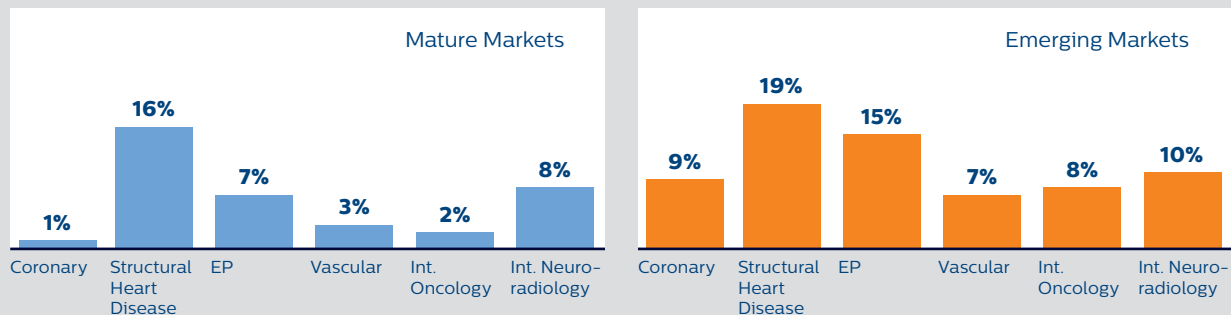
### Improving workflow efficiency “beyond the system”

In addition to access to the latest technology, hospitals have recognized the importance of using process optimization and deep analytic capabilities to radically increase efficiency and competitiveness. To further enhance the benefits already achieved with the Philips Azurion system, a detailed analysis of procedural data and interventional department workflow was performed by the Philips team to identify and address key challenges “beyond the system” in areas such as facility design, staff and patient scheduling, information flow, and patient transport.

Comprehensive procedure and system data was combined with analysis of the facility layout to identify opportunities to optimize workflow around the interventional lab. Infrequently used space was reimaged to create a holding area to reduce patient stress and provide a nearby reading/reporting area to allow physicians to remain in close proximity to the lab.

St Antonius and Philips worked together to define improvement opportunities; developing scenarios for implementation and prioritization. The cooperation resulted in the start-up of improvement initiatives with St Antonius-led teams.

### Annual procedure growth rate<sup>4</sup> from 2014 to 2024



Interventional procedures are growing in both mature and emerging markets. However, more complex interventional procedures like TAVR and Embolization are growing at a faster rate. As a result, interventional departments will have more patients to treat with longer average procedure times. To prepare for this future demand, hospital administrators need to find ways to both optimize clinical workflows and maximize the use of their limited facility space in the near term. Efficient operations supported by a system with time-saving features will enable this growth of minimally invasive procedures.

*Example: A baseline of 300 EP procedures in 2014 will grow to an estimated 590 procedures by 2024 in a mature market*

## Economic impact

Philips has a long history of working with healthcare facilities to help them improve their clinical processes and care environment. More and more, healthcare executives are turning to trusted partners to provide objective guidance, fact-based analytics, and expertise to support their financial goals as well. In and around the interventional suite, more efficient utilization of equipment and optimized workflows can mean higher patient throughput, less patient wait time, and an enhanced patient, staff and physician experience. Workflow improvement achieved with Philips Azurion system enabled St. Antonius to **treat one more patient per day**. In addition, the time savings resulted in a **25% reduction in planned cases finishing late**, which contributes to reduce overtime expense and employee satisfaction.

“The success achieved was possible due to the deep and trusted partnership we have with Philips. The Azurion installation provided our interventional team the opportunity to evaluate our existing processes and standardize workflows. This helped us make tangible and significant operational improvements in the short-term, and fostered a continuous improvement culture amongst the team. The positive impact on patient and staff satisfaction further contributes to our reputation as a leading vascular institute.”



**Wout J. Adema, CFO,**  
St. Antonius Hospital, Utrecht/  
Nieuwegein, the Netherlands

**Marco van Strijen, MD,**  
Interventional Radiologist,  
St. Antonius Hospital, Utrecht/  
Nieuwegein, the Netherlands.



“With the Azurion system, we were able to change our workflow in such a way that we now can do more patients in a single day, resulting in more patients a week, resulting in more patients per year, with no compromise to patient safety or quality of care.”

## Sustainable success

St. Antonius was among the first hospitals world-wide to install Azurion, a highly-advanced interventional suite for image guided therapies. The combination of Azurion's state-of-the-art hardware platform, flexible workflow approach and enhanced training delivery allowed St. Antonius to make impressive improvements in efficiency and patient care. Investment in the latest technology is critical to success, but technology can only be used to its full potential if its users work methodically, confidently and in close cooperation with one another.

1. Philips Azurion Simulation Study 2016 - 12NC 452299123041 - FEB 2017
2. Mangram AJ, Horan TC, Pearson ML, et al. The Hospital Infection Control Practices Advisory Committee. Guideline for prevention of surgical site infection, Am J Infect Control.1999;27:97-134.
3. Alexander JW, Solomkin JS, Edwards MJ. Updated Recommendations for Control of Surgical Site Infections. Annals of Surgery. 2011;253(6):1082-93.
4. Procedure growth data provided by Millennium Research Group and Philips analysis.



### How to reach us

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