PHILIPS

Image guided therapy

Hybrid OR

High utilization of the multi-purpose Hybrid OR

Treating more patients in a wide range of clinical specialties at UKSH in Kiel, Germany

An extensive data study and interviews with OR Manager Joß Giese and his clinical stakeholders show a successful implementation of multi-purpose use in the Hybrid ORs at UKSH Kiel. “The Hybrid OR was always intended to be multi-purpose, right from the start, and this is a concept that we strongly believe in,” Mr Giese says.

The Hybrid OR facilities at UKSH Kiel enable advanced minimally invasive procedures for a wide range of clinical specialties, with clear benefits for patients. Physicians from multiple clinical disciplines were closely involved in the room design process.

Thanks to the Philips imaging system’s unique characteristics, which range from gantry positioning flexibility, to full body coverage, to its compact design and ease of use, clinical teams can follow the optimal workflow for each procedure they perform.

To discover just how beneficial this Hybrid OR system has been for UKSH, Philips Healthcare Transformation Services (HTS) analyzed three years of clinical, operational and financial data from the 2017-2019 period. While many previous studies have focused on regular ORs, this is one of the first studies to investigate the operational performance of Hybrid OR facilities. The results clearly demonstrate that multi-purpose Hybrid ORs can be very efficient and financially viable, with real benefits for the clinical specialties that use them.

In this case study:

Comprehensive data study of Hybrid OR usage

- The key results of an extensive data analysis
- High room occupancy enabled by a multi-purpose design

Flexibility key in multi-purpose environment

- Access for specialties with all case volumes
- Efficiency in advanced procedures achieved thanks to optimal workflows

A glance into the future of Hybrid OR operations

Who:
Operating room department at UKSH (Universitätsklinikum Schleswig-Holstein), Kiel, Germany

Challenge:
Analyzing operations and financial performance of multi-purpose Hybrid ORs

Key results:

8 clinical specialties

2.4 procedures a day

87% room occupancy

6.9 case complexity[1]

Revenues exceed cost by **5%**

Results from case studies are not predictive for results in other cases. Results in other cases may vary.

Analyzing operations and financial outcomes

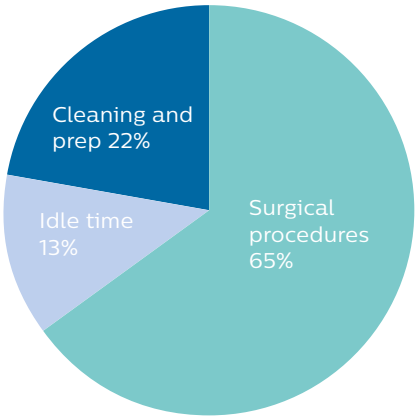
of the multi-purpose Philips Hybrid ORs at UKSH Kiel from 2017-2019 – together with Philips HTS

UKSH is one of the benchmark facilities for German healthcare insurers, on which new reimbursement fees are based. The German DRG reimbursement system is designed to set up hospitals for a no-profit, no-loss compensation per year. As such, it is particularly important that UKSH is able to work with a high degree of efficiency and effective financial management, including the performance of more profitable complex procedures where feasible.

To investigate how the Philips Hybrid ORs have made a difference for UKSH, Philips Healthcare Transformation Services (HTS) conducted an extensive data study, analyzing operations and workflows in UKSH's multi-purpose Hybrid ORs. This involved analysis of a range of clinical, operational and financial datasets for the years 2017, 2018 and 2019, and included the quantification and presentation of case load, efficiency measures and financial outcomes.

As the consulting practice of Philips, HTS was ideally positioned to perform this comprehensive study.
HTS provides strategic, solutions-oriented recommendations to help customers address their most complex clinical and operational challenges. And through innovative, collaborative, and patient-focused engagements, HTS can help hospitals and healthcare systems to transform care delivery for their community.

Room utilization



The Philips HTS study showed that the multi-purpose Hybrid ORs were utilized very effectively, with a recorded idle time of only 13%.

UKSH multi-purpose Hybrid OR case mix

	Vascular surgery	Cardiac surgery	Cardiology	Spine surgery	Other surgery
Case Mix Index	4.6	9.6	6.9	3.7	7.3
Procedure length	2h57	2h12	1h20	2h26	2h17
Case examples	femoral endometrial ablation, embolectomy, carotid procedures	transaortal or transapical TAVIs	transfemoral TAVI, heart catheterizations	dorsal spondylosis, placement of internal spine fixations, removal of external spine fixations	explorative laparotomies

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Key results observed
at the UKSH multi-purpose Hybrid ORs

The solution's flexibility has enabled an average **of 2.4 procedures a day** (typically working from 08:00 to 15:30), with a **room occupancy of 87%**

99% of the cases were performed by **four specialties:** cardiac surgery, cardiology, vascular surgery and trauma surgery (spine)

4 further clinical specialties occasionally used the Hybrid ORs as regular ORs for cases without imaging

The multi-purpose setting accommodates **access to an advanced treatment environment** for clinical disciplines of **all case volumes**

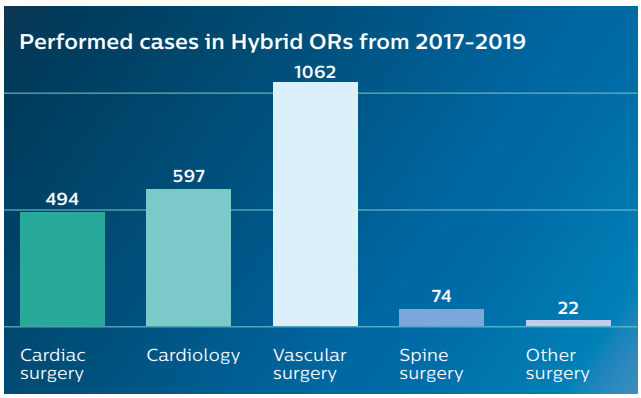
Case complexity (CMI)[1] ranged from 3.7 to 9.6 with an average of 6.9
(ca. 7 times higher than the German average complexity), including

- minimally invasive surgery requiring imaging guidance
- catheter interventions with high risk of needing to convert to surgery (TAVIs)
- combined open and catheter procedures (hybrid)

The case mix and utilization rate ensured **Hybrid OR revenues have exceeded costs by an average of 5% every year from 2017-2019**

High utilization enabled by multi-purpose design

As the OR Manager at UKSH in Kiel, Mr Giese acts as a 'linking pin' between the hospital's clinical disciplines. "When I joined UKSH n 2013, most of the surgical disciplines had their own OR, with rooms, systems and nurses belonging to specific departments," he recalls. Working together with colleagues from across these clinical specialties, Mr Giese oversaw a centralization of UKSH's OR management processes and is now responsible for coordinating between the disciplines.



From the start of discussions regarding the acquisition and installation of a Hybrid OR, Mr Giese and his team prioritized a multi-purpose design. "We don't have a single clinical discipline that can occupy our Hybrid OR capacity for five days a week, from morning to evening, with high-value procedures," he explains. "Theoretically, you could use this OR capacity to perform minor procedures, but from our perspective, a Hybrid OR is only worthwhile and financially viable when we use it to perform the right mix of complex procedures, where there is also a clinical benefit for the patient."

In that sense, the Philips Hybrid ORs immediately became an asset to Mr Giese and his colleagues across multiple clinical specialties. "For us, the multi-purpose nature of the Hybrid OR is essential. It's the only way we can achieve a consistently high case load," he confirms.

The Hybrid OR capacity is predominantly used by four clinical specialties in particular: cardiac surgery, cardiology, vascular surgery and trauma surgery. Together, these disciplines account for 99% of the Hybrid OR cases during the period from 2017 to 2019. However, the capacity has also been utilized by a further four clinical specialties during this time, with an average of 740 procedures being performed every year, at an average of 2.4 procedures per day. In fact, there is the potential to perform an even higher number of cases per day; future projections indicate scope for up to approximately four procedures per day in two Hybrid ORs in use at UKSH Kiel.

Studies have shown that Hybrid ORs can help improve patient outcomes, shorten patient recovery times and reduce the length of patient stays, potentially decreasing costs for healthcare organizations.[2,3]

"For us, the multi-purpose nature of the Hybrid OR is essential. It's the only way we can achieve a consistently high case load."

Joß Giese, OR Manager, UKSH Kiel

Access to an advanced OR environment for spine surgery

Many clinical disciplines at UKSH benefit from the flexibility of the Philips Hybrid OR – not least the trauma surgery department, which is led by Prof Dr Andreas Seekamp. Where the compact ceiling-mounted design is concerned, Prof Seekamp echoes the views of his colleague Mr Giese: "A ceiling-mounted system is very positive and convenient for us because of the way it frees up floor space, rather than having a solid base that we need to work around."

Prof Dr Andreas Seekamp
Head of Trauma Surgery, UKSH Kiel

Prof Seekamp and his team utilize UKSH's Hybrid OR capacity for patients with vertebral spine fractures, plus fractures to the pelvis or acetabulum. As Prof Seekamp remarks, "We previously operated on these patients in a regular OR with a regular mobile C-arm. In these cases, the advantage of the Philips Hybrid OR is the flexible ceiling-mounted system for performing 3D scans."
Specifically, the 3D intra-operation cone-beam CT enables the clinician to see the spine in 3D and check the screw position in the axial plane. As Prof Seekamp adds, "This is very important for us, and is not something that can be done with conventional X-ray scans."

> "The large orthograde images allow us to **see exactly what we need to see – at the right angle and with real clarity."**

During spine procedures, the C-arm of the system is positioned to the patient's right-hand side to enable an optimal workflow.

Putting the surgeon in control

Prof Seekamp and his team also benefit from the C-arm's user interface design. In the past, it would have been necessary for a table-side nurse to manually set the position of the mobile C-arm according to the instructions of the operating surgeon – but now, as Prof Seekamp explains, "We can use the table-side control module to set the C-arm position automatically. This saves us valuable time and effort, as we previously required a nurse to make these adjustments manually according to our instructions."

Exceptional image quality plus 3D capabilities

Prof Seekamp also highlights the high-quality imaging that the Philips system delivers for highly complex spinal procedures. "The image quality and breadth of the scan is a real positive from our perspective," he comments. "The large orthograde images allow us to see exactly what we need to see, at the right angle and with real clarity."

High-quality imaging is becoming increasingly vital in the field of spine surgery. As Prof Seekamp observes, "In the operative treatment of spinal fractures, there has recently been a definite shift to minimally invasive methods. We have found that we can exclusively treat most of the seemingly simple fractures minimally invasively. Because we are not doing open surgery, we rely on an improvement in the imaging quality."

As a result of the size and breath of the scan images, Prof Seekamp and his team also benefit from efficiency gains as they perform their procedures. "Because the images are larger, we don't need to capture as many images to see everything we need to see – whereas a regular C-arm would need to be moved several times to achieve the same extent of imaging," Prof Seekamp observes. And both clinician and patient alike benefit from the ability to perform a 3D scan at the end of a procedure. As Prof Seekamp explains, "You can only bring the patient out of the OR for a post-operative CT scan after the operation has already been completed. Now, with the 3D scan, we can check the screw position intra-operatively and make any necessary corrections when needed during the surgery. This replaces the need for a post-operative CT scan and reduces the likelihood of requiring a second operation."

Paving the way for complex yet

Optimal workflows in vascular and cardiac surgery

This breadth and quality of imaging is also crucial within the clinical specialty of vascular surgery. As Dr Rouven Berndt, Deputy Head of Vascular Surgery at UKSH, highlights, “For us, the region of interest (ROI) stretches from head to toe – so it is vital that we are able to cover and map the entire body from two sides of the table.”

Dr Rouven Berndt
Deputy Head of Vascular Surgery, UKSH Kiel

For vascular surgery procedures, entire body imaging from two sides of the table is key to achieving the best clinical insights and optimal workflow.

The Philips Hybrid OR offers benefits to both vascular surgeons and patients alike, in terms of the type and complexity of procedures that can be performed there. As Dr Berndt notes, “Anywhere between 40 and 50 percent of our cases are hybrid operations, combining surgical and catheter-based treatments.”

In this regard, the system has helped Dr Berndt and his team to evolve the quality and breadth of care they can deliver. “Many procedures were not possible for us here before our Hybrid OR capacity was created – the hybrid procedures in particular,” he reflects. “In the past, patients would receive a stent during an intervention and have to come back six or seven weeks later for an operation. Now, this can all be done in a single procedure – helping to reduce our patients’ stress and the number of appointments they have to attend.” Moreover, as patients no longer have to recover from multiple procedures, they may benefit from a shorter length of stay at the hospital, with a corresponding drop in the level of patient management resources they require.[4]

The powerful benefits of a ceiling-mounted Hybrid OR system

“If you want a multi-purpose Hybrid OR, **the system needs to be ceiling-mounted**; it’s the only way for so many disciplines to work there efficiently. For single purpose or specialty, you could work with a floor-mounted system – but in a multi-purpose Hybrid OR, you need to have greater flexibility.”

Joß Giese, OR Manager, UKSH Kiel

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efficient procedures

Steffen Wundram
TAVI Coordinator,
UKSH Kiel

Benefits for staff and patients alike
Dr Berndt's enthusiasm for utilizing the Philips Hybrid OR facilities in Kiel is shared by Steffen Wundram, TAVI Coordinator at UKSH. "The Hybrid OR is the only place where we perform TAVIs at UKSH, and we certainly feel this setup is efficient and well suited to TAVI procedures," Mr Wundram observes. For TAVIs and other cardiology procedures, it is important to be able to position the C-arm at the head end.

Mr Wundram is responsible for the coordination of all TAVI patients and procedures. He has also been personally involved in the development of standardized operating procedures for all TAVI procedures performed in Hybrid ORs – with the same setup, start and preparation processes, including consistent positioning of the C-arm. This standardized approach benefits all parties, as Mr Wundram explains: "These protocols support those of us who work with the system, but also benefit the patients in our care – helping to ensure a positive patient experience at every stage, from preparation to post-TAVI monitoring."

For TAVI procedures, the C-arm is positioned at the head end, freeing up space to improve access to the patient and ensure an efficient clinical workflow.

High efficiency for TAVI procedures
The results of the HTS-led data analysis at UKSH underline the efficiency of TAVI procedures performed using the Philips Hybrid OR system. For example, a total of 587 transfemoral TAVIs were performed during the three-year analysis period. Not only is this a high number of TAVIs, but these individual procedures can be performed in a very efficient way, with an average procedure time of 82 minutes.

This high efficiency means that while the typical daily routine for other procedure types would typically allow for two surgical procedures a day, Mr Wundram and his team have the ability to push beyond that number if needed: "By squeezing our cleaning/preparation times and idle times, we have created the scope to perform one additional TAVI procedure each day."

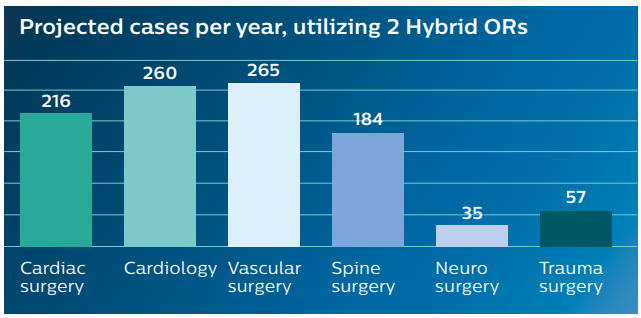
About UKSH

UKSH (Universitätsklinikum Schleswig-Holstein) is one of the largest medical centers in Europe. It delivers high-quality medical care in Germany's northernmost federal state, including for patients who require highly differentiated diagnosis and therapy. As a university hospital, it benefits from the interaction between healthcare, research and teaching, with the result that scientific findings flow directly into the health system.

UKSH has 14,000 employees in over 85 clinics and institutes, and commissioned its first Philips Hybrid OR in 2013. During 2018 and the first half of 2019, this room was complemented by a second Philips Hybrid OR, before UKSH temporarily reverted to a single Hybrid OR until 2021 due to reconstruction of the OR department.

A Hybrid OR that is fit for the future

Looking ahead, Mr Giese is sure that the clinical specialties he works with at UKSH will continue to make full use of the hospital's Hybrid OR capacity. "When we first installed our Philips Hybrid OR back in 2013, we didn't imagine performing spine and pelvic procedures there – but now we can," he explains. "This is a sign of how the concept is truly future- and innovation-proof for us."



As Kiel's OR capacity continues to grow, Mr Giese expects that there will also be greater use of Hybrid OR technology by other clinical disciplines, such as neurology and pediatric cardiology: "We will gain real opportunities in terms of innovative new procedures, and will be able to strengthen collaboration between disciplines – with radiologists and neurosurgeons working together, for example."

> "If I want to perform a range of very different procedures in a multi-purpose Hybrid OR, **a ceiling-mounted system is the gold standard for me**, because of the high flexibility it provides."
>
> **Joß Giese,** OR Manager, UKSH Kiel

An attractive proposition for clinical specialists

Mr Giese also believes that these advanced Hybrid OR systems will strengthen UKSH's appeal as a place to work. "I could imagine that specialists will certainly be attracted to work with the Hybrid OR," he suggests – and his thoughts are echoed by his colleague, Deputy Head of Vascular Surgery Dr Rouven Berndt: "For a hospital, having such a room and such equipment is beneficial in terms of attracting vascular surgeons to work there. The first question that they ask us is always: do you have an operation suite with the equipment we need to perform these complex procedures?"

Dr Berndt is also well-placed to comment on the growing importance of Hybrid ORs in his clinical specialty. "Hybrid ORs are a major driver for the development of vascular surgery at this time," he observes. "They are having a huge influence in our field and will continue to do so in the coming 10 to 15 years as we move towards less invasive surgical methods. We are only at the start of this journey in this respect."

From Dr Berndt's perspective, the importance of the multi-purpose Philips Hybrid OR facilities at UKSH cannot be overstated: "It's rare for an operating space to have such a huge influence on the development of a clinical specialty," he remarks. "Certain interventions would not be possible for us here without this hybrid operating suite – and it has enabled us to become a center of education for vascular surgery. It's very special for our discipline, and in my opinion, this is extremely important."

Multi-purpose construction is the key

As Mr Giese reflects on the impressive results that have been achieved in Kiel, he is clear on what has made the investment worthwhile – including in financial terms. "Our results show the value of having the room in use as often as possible by a wide range of disciplines. It is also vital to select the right mix of complex, high-value procedures, with the right number of skilled, experienced team members on hand who are familiar with the system."

Mr Giese concludes with advice for other healthcare providers who are keen to take advantage of the benefits of Hybrid OR technology: "Hybrid ORs can be a way forward for many other hospitals providing they are built from the start as multi-purpose ORs – not least because there are so many disciplines waiting to make use of the technology for their own procedures."

[1] CMI refers to the 'Case Mix Index', which is used as an indicator of the average case complexity at a particular hospital. The average German case complexity is normalized to 1.
[2] https://www.ormanager.com/hybridor/article3/
[3] The Cardiovascular Hybrid OR-Clinical & Technical Considerations | CTSNet. (n.d.). Retrieved from http://www.ctsnet.org/article/cardiovascular-hybrid-or-clinical-technical-considerations
[4] https://www.ormanager.com/hybridor/article3/
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