

**White paper**

# How to create the healing environment of the future

The human-centered approach to healthcare facility planning and design

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Edition #06



# Executive Summary

## Transforming care delivery through facility design and planning

Healthcare environments continue to evolve, with new pressures from patients, staff, and payers driving care providers to be more people-centered and value-driven. Meeting the challenges of today's healthcare markets require a re-examination of the way care facilities are planned, designed, built, and operated.

Digital technologies are a significant solution to enable optimization of proposed as well as existing facilities. Simulations, including VR simulations, can offer end-users and planning and design staff a realistic view of the conceptual design, enabling them to optimize the efficiency and satisfaction of both patients and staff before committing to "real world" action. These tools are part of a larger shift toward digitalizing healthcare, which will enable data-based decision-making on both clinical and non-clinical issues.

Designing and operating a modern healthcare facility require the collaboration of planners and designers, medical technology partners, and hospital staff. In addition, clinical departments should come together around care pathways, rather than departmental fault lines, in order to deliver the best possible quality of care and experience for all involved.

Medical technology partners are uniquely qualified to guide healthcare institutions through the lifecycle of their care facilities with advisors whose expertise and experience are enhanced by leadership in medtech innovation and are especially well qualified to provide a fact-based strategic perspective and deep implementation know-how.



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## Market-shaping healthcare trends

Hospitals have always measured the quality of the care they provide in terms of safety and effectiveness. While those measures of quality are still critical, today's healthcare providers must engage with additional forces shaping the market.

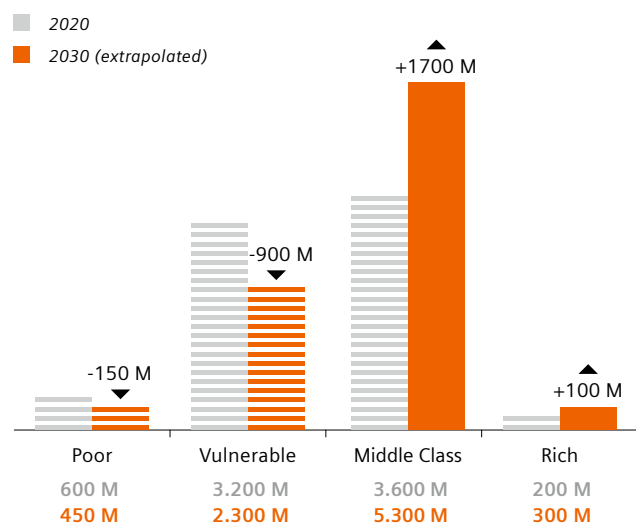
Value-based care, which ties performance ratings and, in some cases, reimbursement, to patients' assessments of the overall quality of care they receive, is on the rise in many Western markets. Patient experience factors are a key determinant of the quality of care in value-based care regimes.

At the same time, there has been a trend toward consumerization of healthcare. Patients have more choice in their healthcare and more input into their treatment plans. Delivering a high-value care experience is of primary importance to healthcare provider organizations, because patients can and will seek alternatives if they are not satisfied.

According to Isabel Nieto Alvarez, Global Marketing Manager for Improving Patient Experience at Siemens Healthineers, patient experience should be divided into two segments. One is the clinical outcome that can be measured and quantified directly. The other is the experience. It is very possible to have a good clinical outcome, but a poor experience: "The clinician tells you the treatment worked, but you still feel poorly, so you're not satisfied, and you don't report a positive experience overall," she explains.

Rising consumerism in healthcare is not limited to the industrialized nations of Europe and North America; the middle class is growing around the world, paced by rapid

Development of the Middle Class 2020–2030<sup>3</sup>



growth in economic output in countries in the Asia Pacific region.<sup>1</sup> This rise in middle class status brings new expectations and demands for more patient-centric care models and more positive care experiences around the world.

Consumerism in healthcare also manifests itself in increased travel for care that is not available or is more expensive in the patient's home country.<sup>2</sup>

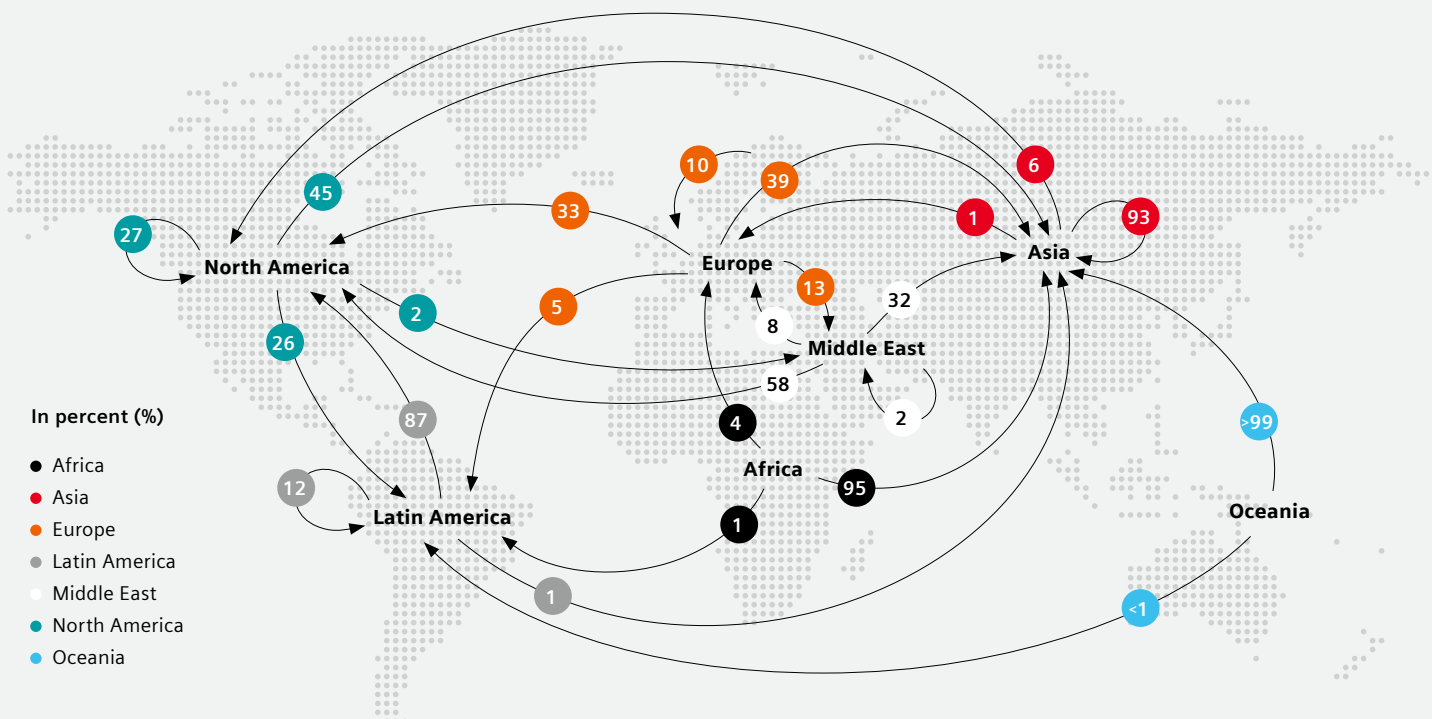
This can provide a significant revenue stream to a healthcare organization. Making an institution attractive and competitive in this market requires dedication to delivering a positive and culturally appropriate experience for both patients and their traveling companions.

Finally, staff satisfaction is of paramount importance to provider organizations. There are more positions on care teams than there are qualified candidates, so competition for employees can be very intense. Minimizing turnover is vital to delivering a good care experience. Keeping staff happy and engaged goes beyond direct compensation; facility planning and design can play an important role in delivering a good experience to care teams, non-clinical staff, and patients.<sup>4</sup>

*“Many people travel now for medical care, and they may bring relatives with them. It’s important to make sure we’re providing the right facilities for them and respecting their cultural and religious traditions, or they may choose to go elsewhere.”*

**Henning Lensch**, CEO of RRP International Hospital Planners.

## Medical travel across the globe



Source: McKinsey, Quarterly 05/2008



# Create a healing environment

## 1 Design healthcare facilities around patients' holistic needs

Patient-centered design is a departure from the design principles that dominated hospital construction from the mid-20th century onward. At that time, efficiency of construction, heating and cooling, and clinician workflow mandated spaces that often seemed cold and “clinical.”<sup>5</sup>

This emphasis on narrowly defined measures of efficiency has been reappraised in the last decade or two, as substantial evidence of the importance of patient experience factors into the healing process has emerged. The physical design of a facility can have a powerful effect in creating a healing environment in which patients can recover more quickly from injury or illness. For example, a comparison of length of hospital stay for patients with beds near a window compared with those whose beds were near a door showed that the “window” patients were in the hospital an average of 0.43 days less than the comparator group.<sup>6</sup> A single-center study published in 2005 found that, following spinal surgery, patients who were exposed to more natural sunlight felt less stress, reported less pain, and used less analgesic medication compared with patients who stayed on the “dim” side of the hospital.<sup>7</sup>

The right design of the room and medical devices play an important role in influencing the patient’s emotional experience. Before the examination patients’ feelings can fluctuate between insecurity, anxiety – and hope. Room

and product designs geared toward these extreme emotional situations can serve as a distraction, give joy, and offer a sense of security.

Biophilic design brings the natural world into the hospital through spaces such as gardens, courtyards, plants, and also items/materials such as glass partitions that have leaf/grass/flower motifs inherent within. Alleviating the environmental stress a patient is under is part of the healing experience. The objective is to make the hospital health oriented, not disease oriented, for patients, staff, and the communities they serve. Recent studies suggest that biophilic design can help speed recovery, decrease analgesic use, and reduce stress.<sup>8,9</sup>

And that situation, in the era of value-based care, can have significant repercussions. Some payers directly incentivize positive measures of patient experience; but even in the absence of a direct financial link, a reputation for great patient experience is a competitive advantage. Thus, improving patient experience is in the best interest of every healthcare institution.

Thoughtful design of a healthcare facility can also improve staff satisfaction, resulting in more empathetic, more effective care. Natural light, effective ventilation, and a quiet environment can help clinicians achieve their best performance. Key patient experience factors, like communication with the care team and coordination of care, have a direct positive correlation with the effectiveness and safety of care.<sup>10</sup>

Picture Reference: MR Showroom at Siemens Healthineers, Erlangen, Germany (1) / Astrid Lindgren Children’s Hospital in Stockholm, Sweden: Title, (2), (3) – Photos: Lasse Burell / Great Ormond Street Hospital for Children (GOSH), London, UK: (4) – Photos: Andrea Artz and Lasse Burell. All Pictures shown are for illustration purpose only.



Clearly, hospital design that facilitates effective communication among staff, healthy collaboration among departments, and respectful, private communications between staff and patients pays dividends. Patients have better health outcomes, and this leads to better overall experiences. Other important factors are increased satisfaction, more engagement, and lower turnover for employees in healthcare facilities. Only then can healthcare providers be positioned to thrive in a competitive, value-based environment.



## 2 Make a commitment to “go green”

Hospitals leave a large footprint on the environment, which can contribute additional health stressors for people. Many organizations are actively seeking to mitigate these environmental factors. Klinikum Forchheim in Bavaria, Germany is one such institution. Designed to admit ample natural light, the hospital also uses a state-of-the-art system known as a Thermally Activated Building Structure (TABS) to reduce heating and cooling costs by taking advantage of temperature gradients between the external environment and the building to provide heat in winter and cooling in warmer weather. Use of TABS and other technologies has enabled the hospital to reduce its environmental footprint substantially.



## 3 Build partnerships that center around patients' needs

As previously described, it is imperative to build healthcare facilities centered around patients and the care pathways they will travel, rather than traditional departmental structures or rigid processes. The mission of healthcare facility planning and design professionals is to create a healing environment that optimizes each patient's experience, while also supporting the care team. To achieve this mission, effective healthcare facility planning requires a robust and dynamic partnership among patients, clinicians, architects, medtech firms, and advisors in order to create a facility that is up to the challenges of both today and tomorrow.



## Examples of patient-centered themes

A multisensory approach to the patient in-room experience is part of the vision of Siemens Healthineers. In order to achieve a holistic in-room experience, the goal is to integrate various elements: sound and aroma, sculptures, ambient room light, a smart storage system, ergonomic patient positioning aids, and a pleasant in-bore experience. Together, these features will create a unique and positive atmosphere.



### Underwater

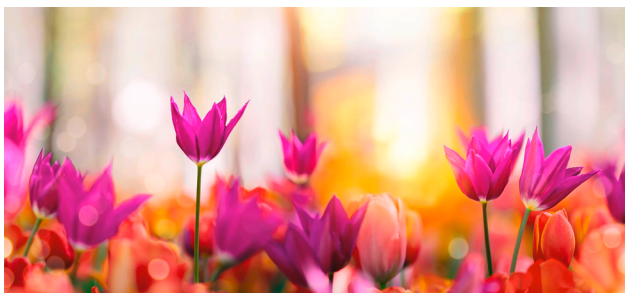
This theme speaks particularly to patients suffering from pain and anxiety as well as children. The bright and fascinating underwater world awakens feelings of being on vacation and suggests a wonderful weightlessness.

The images below show a collection currently of four different themes that fit into the look and feel of the company's products. The themes are all available as static and moving images in high quality and can be applied to the products, walls, or storage items as stickers or projections. A special focus was placed on designing themes that keep the distraction for the medical staff to a minimum.



### Beach

The "Beach" theme is suitable, above all, for claustrophobic patients with its ability to reduce stress and contribute to sustainable relaxation. As the eyes wander over the beach: feelings of warmth, freedom, and relaxation come to mind.



### Flowers

Patients often feel exposed and vulnerable. With its cheerful and naturally positive energy, the "Flowers" theme is suitable for conveying security and harmony as well as blossoming vitality to such patients.



### Jungle

The lovingly designed colorful theme doesn't just make little patients happy – it also offers several highlights for patients of all ages to discover. This theme creates an atmosphere of wonderment, fascination, and joy.

# Key roles for medtech partners

As healthcare has grown more complex, medtech companies have taken on expanded roles beyond their original remit of manufacturing, installing, and servicing medtech hardware. The key competencies that today's medtech partners can bring to bear in healthcare facilities planning and design are described below.

## Advisory Services

Putting patients first is more than just a change in mindset; it is a change in the way healthcare facilities are designed, built, and operated. This change goes beyond the clinical to encompass social and cultural factors as well.

In order to meet the complex challenges of creating a healing environment, medtech advisory teams bring a formidable combination of planning, implementation, and operational capabilities to the table for their partners.

Medtech advisors play important roles throughout the process, from initial feasibility studies and master planning through implementation and ongoing operation and optimization. Dr. Karl-Philipp Kienle, Senior Value Advisor, Siemens Healthineers, describes the roles that value

*"We are moving beyond the traditional roles of patients, nurses, doctors – ultimately we see people who are part of their communities and part of the care team all working together to create this healing environment."*

**Michael Schmitz**, Head of Facility Design & Planning Services, Siemens Healthineers

advisory services plays in planning, designing, and operating healthcare facilities: "Up front, we offer strategic transformational advisory, where we look at the business case, make demand projections, assess competitors, and all the things you need to do in order to plan your project. Then, we help create data-driven care pathways and perform process and layout optimization so that the facility will be up to the challenges of today and tomorrow."

## 3 key phases of advisory services to create a healing environment:

1

**Feasibility studies and master planning**



2

**Layout review & exchange with key stakeholders**



3

**Layout optimization with data-driven care pathways**





## Planning and visualization

Building modern healthcare facilities around the patients they will serve and the care teams that will work there requires extensive research and planning. But even the most sophisticated clinicians may not grasp the implications of a layout when viewed in flat technical renderings.

That's where 3D and 4D simulation tools come into play. These digital tools (such as SitePlanner, developed by Siemens Healthineers) can rapidly create a prototype layout for a new facility, from a single imaging or OR suite to an entire hospital wing, without ever breaking ground. In addition, VR capabilities help end-users of the facility to experience what it's like to be on the floor and adjust the layout of the space to meet their needs in a more powerful and direct way than architectural drawings permit.

*"It's remarkable to see people who don't have a technical background, how it suddenly clicks when they get to walk through the suite before we've even built it."*

**Håkan Strannelind**, Business Manager, Sweden,  
Siemens Healthineers

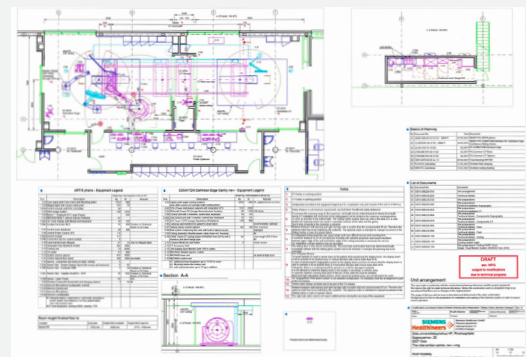
These simulation tools can also help optimize non-clinical spaces and workflows. "Let's look at the whole reception process for new patients in a hospital. Now, we can enable patients to do part of the registration at home. The whole workflow at the reception area can be streamlined. And this has a strong impact design and patient experience," said Michael Schmitz, Head of Facility Design & Planning Services, Siemens Healthineers.

## Siemens Healthineers SitePlanner

Unique real-time, interactive, and virtual experience.

Tools like SitePlanner give architects, planners, and end-users the power to not only ask "what if," but to also answer such questions with minimal effort and expense.

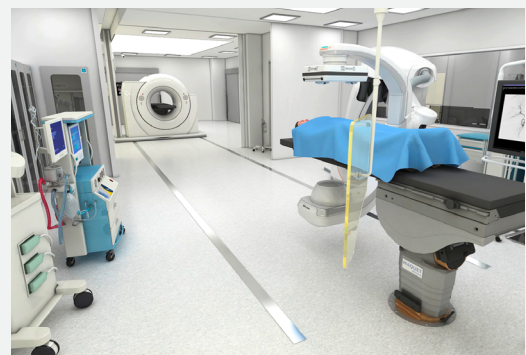
### 2D Layout



### 3D Rendering



### 4D Real-time Visualization with Virtual Reality



## Transforming healthcare delivery with digital optimization tools

The creation of a high-fidelity “digital twin” of a facility enables healthcare providers to test changes to processes and/or layout without costly rearrangement of the actual physical space. The fidelity of such workflow simulations is increased by the addition of multiple robust data sources, including RTLS (real-time location systems) data from various assets and entities. The predictive capabilities of workflow simulation makes it a powerful tool for rapidly validating layouts and workflows.

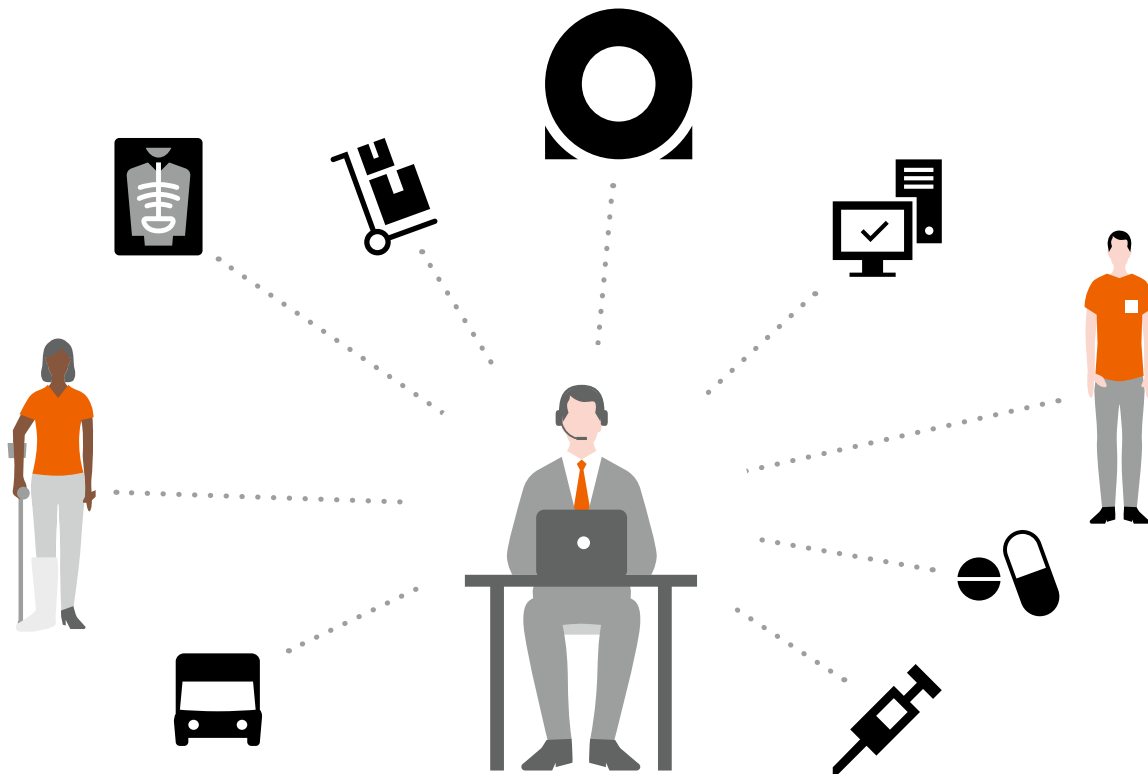
Digital tools for workflow simulation also help hospital administrators create an environment that optimizes efficiency as well as patient and staff satisfaction. For example, simulations can help designers strike the right balance between patient privacy needs and utilization rates of capital equipment like MRI scanners by informing decisions on the placement and number of patient dressing rooms and prep areas.

RTLS (real-time location systems) can track the status and location of medical equipment, and can also help patients find their way around large and often confusing hospitals. Coupled with clear and intuitive physical wayfinding signage, RTLS can demystify the hospital experience and get patients through the physical environment quickly and safely. RTLS sensors can also detect potential falls or other potential problems more quickly. In terms of planning and optimization, RTLS technology can be leveraged to provide data for a high-fidelity model of processes, enabling optimization with tools like workflow simulation.

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➤ The value of workflow simulation

Read in the white paper about the application areas of workflow simulation technology in the healthcare sector and uncover the positive impact on multiple stakeholders.





# Partnership in action: Helse Stavanger University Hospital

## The customer

Helse Stavanger HF is a university hospital in Stavanger, a city of 130,000 in southwestern Norway. The hospital is in the midst of a significant expansion, with the construction of a new building expected to be completed in 2023. The staff of Helse Stavanger HF strives to provide the best possible care and treatment to their patients every day. The new construction is an important step toward their goal of becoming the best hospital in Norway, and a benchmark for other hospitals.

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### About Helse Stavanger HF

- Located in the city of Stavanger, Norway
  - Mission: To provide the best possible care and treatment to their patients – every single day
  - University hospital with radiology and interventional & nuclear medicine department
  - Staff of 7,500 drawn from 30 nationalities
  - 600 beds
  - Serves a population of 369,000 in Stavanger and the surrounding area
- 

Illustration: © Nordic Office of Architecture / Aart Architects.









## The challenges

A new facility presents an opportunity to create an environment that maximizes efficiency, improves patient and staff satisfaction, and delivers positive clinical outcomes. After reviewing initial design drawings, key stakeholders at Stavanger were concerned that the allocated area for the radiology and interventional & nuclear medicine department may not be sufficient to deliver the desired efficiency, satisfaction, and outcomes. Of particular concern was the patient flow, as the initial plans dictated a relatively long transport route for acute patients, who would have to pass through the inpatient and outpatient areas to access services.

### The key concerns with the design proposal were:

- Initial plans intended to keep some services (PET and SPECT) at the old hospital and implement the new radiology service in the new hospital building in two phases over 5-10 years
- Insufficient area for important ancillary facilities like changing rooms, recovery rooms, etc., which are critical to maximizing utilization and satisfaction
- Lack of flexibility for anticipated future expansion of the department

## The solutions

Siemens Healthineers started by collecting data about operations and processes within the diagnostic radiology department in order to suggest optimal layout planning for CT, MR, and Nuclear Medicine.

In very close conjunction with the Stavanger staff, Siemens Healthineers Value Advisory Services conducted a five-day assessment wherein they recorded all processes and process steps in diagnostic radiology as well as interventional radiology and cardiology. Together with all relevant stakeholders such as doctors, nurses, technicians, and supporting staff, Siemens Healthineers determined their daily needs, wants and no-gos for an individually tailored layout.

Next, a market development study was conducted, enabling Stavanger to forecast future capacity needs.

Helse Stavanger HF sought help from Siemens Healthineers to ensure that all departmental operations could be carried out, at the appropriate scale, under one roof. Consolidating in one location within the new facility would be beneficial for both workflow and patient experience.

Another imperative was to honor the voices of the clinicians who would soon be working in the new facility, so that the new departmental layout would meet their requirements for workflow efficiency and clinical excellence. Drawing on the experience of more than 7,000 planning projects, Siemens Healthineers was a strong partner in helping Helse Stavanger HF reach its potential.

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### Key challenges at a glance:

- Transform care delivery around clinical pathways
  - Incorporate input from clinical staff regarding workflows
  - Locate all department facilities under a single roof
  - Create forward-looking facility with room to grow
- 

Equipped with this information, the combined Stavanger-Siemens Healthineers team applied what they learned to the proposed layout for the radiology department. Multiple interviews with Stavanger stakeholders were held throughout the iterative layout review process, allowing for the development of an optimized layout that would meet the needs of patients and staff.

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### Solutions and expertise deployed at a glance:

- Process mapping
  - Market development study
  - Stakeholder interviews
  - Layout review
  - Layout optimization
-

## The results

These data collection, layout review, and layout optimization processes culminated in a recommendation to double the floor space for the radiology department in the new facility in order to bundle all services at one location and provide room for workflow optimization and flexibility. The new layout, co-created and endorsed by the Stavanger staff, was designed around patient pathways. Input from the staff ensured that the new layout would optimize efficiency and enhance the experience of both patients and staff who would use the space.

The new proposed layout provided for important spaces like prep areas, changing rooms, and recovery rooms. Lack of appropriate facilities can compromise patient experience and cause bottlenecks, decreasing utilization rates and patient throughput.

The revised plan also provided for ample sunlight throughout the department, contributing to a positive healing environment for clinical staff and patients alike.

Finally, Siemens Healthineers helped the radiology department advocate for the proposed changes. Hospital administration has since adopted the recommendation to double the floor space; other recommendations from the combined team may be incorporated into the finalized layout.

*“The interdisciplinary team from Siemens Healthineers contributed great ideas for an innovative imaging department layout to the hospital construction project and brilliantly implemented our thoughts and wishes.”*

**Terje Daniel Bakkelund**, Head of Radiology,  
Helse Stavanger University Hospital

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### Results of layout review and optimization at a glance:

- Recommendation to double area allocated for radiology department
  - All radiology processes and equipment to be located under one roof
  - Proposed layout would optimize workflow, patient flow, and processes
  - Revised design would accommodate projected future need for expansion
  - Other specific recommendations may be incorporated into final design
  - An empowered staff whose ideas are helping to create an efficient and pleasant working environment
- 





## Conclusion

### The hospital of the future: An integrated enterprise

Until recently, an architectural firm would design the physical space, after which medical technology vendors would supply the equipment needed to make the facility operational. The accelerating pace of development in medical and other technologies has rendered that paradigm obsolete. What's needed today is tight coordination throughout the project between architects, medical technology partners, end-users, and administrators.

"As architects, our design can only be as good as the data we receive. Working with the people who will use this facility, and with a partner like Siemens Healthineers, who has deep insight into both the technology and the clinical aspects of modern healthcare, is a huge advantage," according to Henning Lensch, CEO, RRP International Hospital Planners.

### Partner with Siemens Healthineers to transform care delivery

Siemens Healthineers is more than a leading medical technology provider; we are also a trusted partner in facility planning and design. The company has a track record of working with cross-functional teams to develop innovative care facilities and healing environments. Partner with Siemens Healthineers to develop your hospital of the future.

The challenge these days is to also ensure that the facility is sustainable and delivers a positive experience to both patients and staff. "The staff must be happy in order to do their jobs well," Lensch added.

Innovation and teamwork are central to the Siemens Healthineers offerings in facility planning and design. The company has extended its capabilities beyond clinical equipment and departments like surgery, imaging, and diagnostic labs. Today advisory services teams can help administrators assess, plan, implement, and optimize the performance of disparate departments and functions adjacent to those core areas by leveraging the operational experience and insights garnered over the years and combining them with innovative technology. Giving the Siemens Healthineers Value Advisory Services team a seat at the table during the earliest stages of planning ensures that their expertise delivers the greatest benefit to the patients and staff who will use a new healthcare facility.

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#### Would you like to learn more about creating a healing environment?

Contact Siemens Healthineers on Facility Design & Planning Services:

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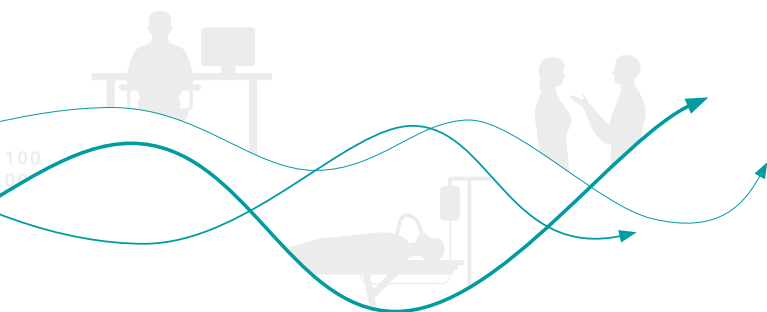
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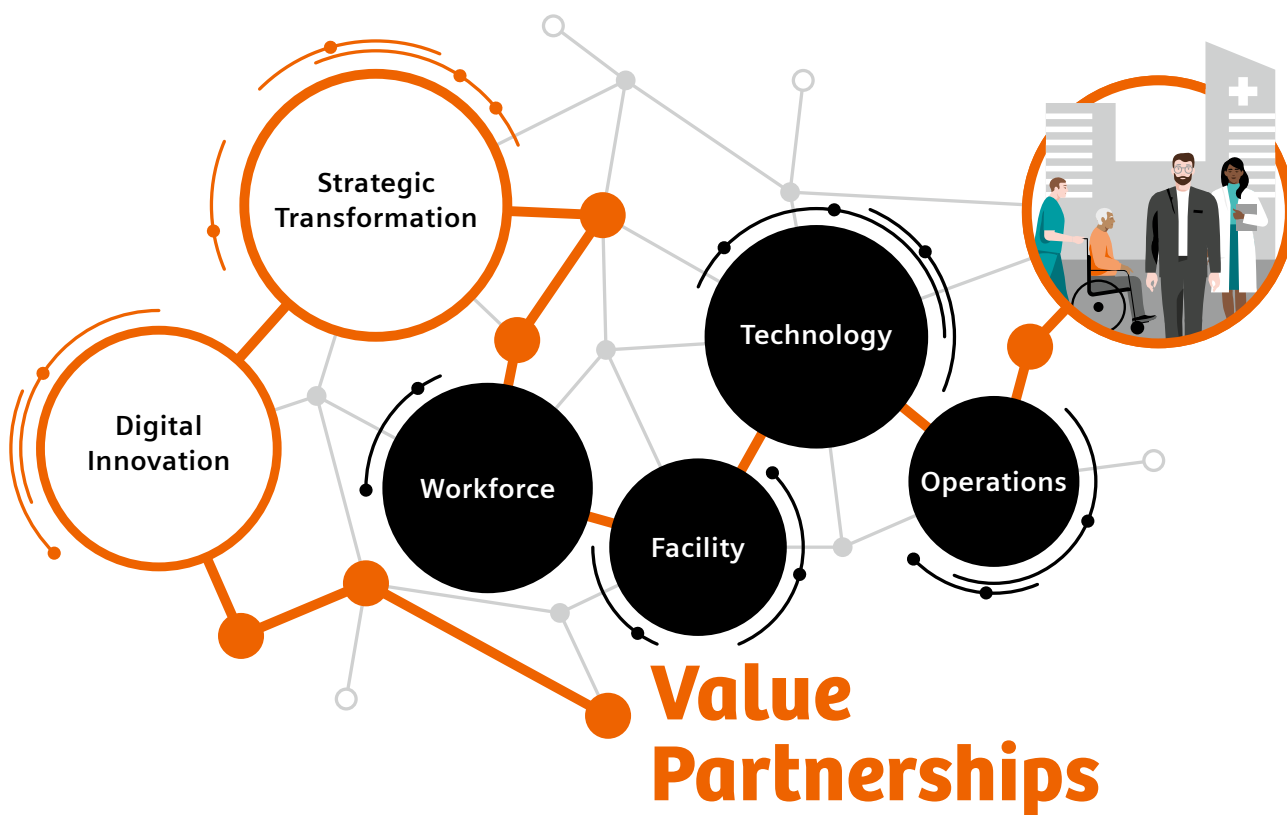




## About Value Partnerships

Siemens Healthineers Value Partnerships are long-term, performance-oriented, collaborative engagements. We bring a combination of clinical insight, medical technology innovation, strategic vision, implementation expertise, and operational excellence to the table for you. As trusted partners, we help you formulate and achieve your strategic goals, increasing enterprise-wide value.

Value Partnerships drive value across your entire enterprise with focus on four domains: Technology, Operations, Workforce and Facility. Furthermore, together we enable breakthroughs through holistic and transformative initiatives such as Strategic Transformation and Digital Innovation.





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The results described herein by customers of Siemens Healthineers were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.

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