



Issue 4

Case Study Series

Radiology of the future

The Potential of Networked Care for Radiology

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Introduction

A recent study has identified five megatrends that have a large potential influence on the health care delivery system in Switzerland¹. These trends implicate that the traditional hospital concept needs to change.

In the following, we highlight four trends. The 5th trend deals with the “broadening of the meaning of health” and is not described in more detail because of limited implication to this paper.

“Traditional hospital concepts need to change.”

Adrian Schmitter, CEO at Kantonsspital Baden AG



1. Socio-demographic shifts

Aging populations and the rise of chronic diseases are changing the healthcare landscape. There is a need for more flexible and adaptable care models that can address the complex and long-term healthcare needs of an aging population.



2. Empowered patients

Patients are becoming more empowered and involved in their healthcare decisions. The traditional hospital model, with its hierarchical structure, is giving way to more patient-centered approaches that prioritize cooperation, shared decision-making, and personalized care plans.



3. Changes in care and care models

New forms of interactions between patients and care providers, integrated care and interprofessional collaboration, and the importance of primary care overall has been strengthened through the demand of society, politics and cost pressure.



4. Digitalization in healthcare

Technological advancements, such as telemedicine, wearable devices, and remote monitoring, allow for more decentralized and patient-centric care. These technologies enable healthcare professionals to monitor and manage patients outside of the traditional hospital setting and have gained in importance through the Covid-19 pandemic.



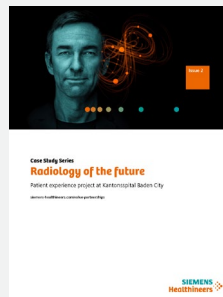
Figure 1: Overview of megatrends of the Swiss healthcare system

This paper is the fourth part of the series “Radiology of the future”.

You can download the papers on the Siemens Healthineers website:



Part 1:
Defining trends in radiology and practical examples of implementation



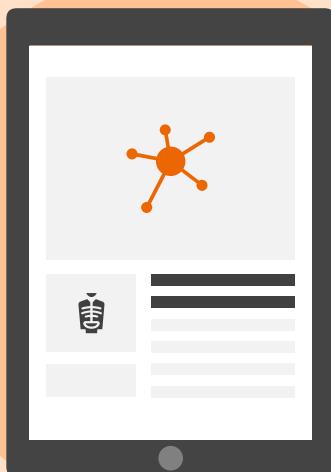
Part 2:
Patient experience project at Kantonsspital Baden (KSB), Switzerland



Part 3:
Encouraging patient empowerment for a personalized, value-based breast cancer pathway at KSB

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Summary

In summary, the traditional hospital concept as well as associated radiology models need to change to align with the evolving landscape of healthcare, including cost considerations, staff shortages, technological advancements, patient empowerment, and changes in care, e.g., the trend toward outpatient treatment.

New models that embrace these changes aim to improve efficiency, accessibility, and overall health outcomes. In the subsequent sections, we will take a closer look at the "hub and spoke model" which is replacing the traditional hospital concept, including the role of radiology departments.

Hub & Spoke in general

In a hub and spoke model, a "hub" serves as a central connection point for a series of external "spokes". Hub and spoke models are often used in logistics and transportation systems. One example would be a warehouse or distribution center as a hub and retail stores as spokes to achieve efficiency and cost-effectiveness.²

Hub & Spoke in the hospital sector

The hub and spoke model is gaining increasing importance in the Swiss healthcare system. In the healthcare sector, the "hub" usually refers to a large hospital that ensures highly specialized care, while the "spokes" refer to smaller, regional health centers and so-called "walk-in clinics" that also offer patients high-quality radiology diagnostics. These spokes are graded according to the level of care.

A study from PricewaterhouseCoopers (PwC) has shown that such hub and spoke models in the healthcare sector can "on the one hand, achieve higher process efficiency and thus higher patient orientation in treatment quality as a care network of a healthcare region. On the other hand, a reduction in costs can be achieved by reducing the use of infrastructure that is not needed."⁴

All in all, process and cost efficiency can be achieved by synergies, scaling effects due to higher volumes and higher utilization of the spokes' infrastructure while ensuring high quality.

The Institute of Radiology at Kantonsspital Baden (KSB) has implemented such a hub and spoke model over the past years where KSB serves as the hub. This model revolutionizes the efficiency and quality of radiology services and specialized diagnostics.

At the core of this model is the main site, offering a comprehensive range of imaging services, including interventions and nuclear medicine. This is complemented by five "spokes"⁵ that provide a complete diagnostic radiology offering across various local facilities, such as Spital Leuggern and several outpatient centers. This structure ensures high-quality care, close to patients' homes. The following case study shows the benefits that can be achieved by opening or operating regional satellites.



Figure 2: Map of location of hub and spokes of Kantonspital Baden located in the eastern part of the canton of Aargau and the Limmatfeld

Case study

Cooperation among different radiology sites


The KSB core site (hub) manages the sites (spokes) in terms of organization, processes, and quality. All sites strive for optimal economic conditions, high-quality standards, innovative care, continuous improvement, and smooth processes. The centralization of the main office at the hub increases efficiency. The centralization of the functional competence in imaging diagnostics enables organ specialization.

Convenience for patients is increased and feasibility for referring doctors is also optimized. Certain services such as nuclear medicine, vascular interventions or cardiac MRI under stress are only offered at the hub, and access to all preliminary examinations is available there. Radiological services are offered 24/7 at two locations - KSB and Leuggern, a site where KSB radiological services are provided for the regional hospital ASANA Leuggern⁶.

Because of a teleradiology connection from the spokes to the hub, organ specialization can also be supported at the spokes, since specialists can be consulted virtually. As a result, patients benefit from convenient access to advanced expertise. At the same time, active management of patient flows preserves vital capacity for severe and acute cases. The teleradiology connection also enables 24/7 care across the hub and spoke model. Maintaining regional care at KSB is especially important for the aging population. This is also made possible by remote scanning, as explained in the next section.

The radiology departments of the spokes (e.g., Leuggern, Brugg, Limmatfeld) are well integrated into the region through a local core team. The employees like the proximity of the work location to their homes, while still having access to technology. They work closely with the medical service providers in the region and therefore ensure locally incoming patient flows with the goal to maintain regional care in remote areas. KSB has additionally opened a new spoke location: KSB City, next to the train station in Baden. The outpatient ambulatory clinic in the city is intended to offer diagnostics in a modern, healing environment for patients and staff close to a transport hub. The goal is to enable easier access to care and to reduce wait times for patients in the hub.

For further information regarding patient experience at Kantonsspital Baden City, please have a look at the following case study:



Part 2:
Patient experience project at Kantonsspital Baden (KSB), Switzerland

Future plans of KSB include opening additional spokes to enlarge the network and to broaden stakeholder variety e.g. in direction of rehabilitation sector.



Figure 3: Hub (middle) & 5 spokes

Digitalization

Digitalization, automation, and the use of new technologies enable the implementation of hub and spoke models. The use of digitalization and teleradiology enables specialists to share their expertise beyond the confines of the main site. Through this technology, radiologists can diagnose and consult regardless of their physical location,

supporting that the specialized expertise of organ-specific experts are available everywhere. Additionally, digitalization allows seamless access to patient records, including clinical information and laboratory or pathology reports, from any site.

“Digitalization is key for successful hub and spoke models in the healthcare sector.”

Frédéric Schoenahl, Head of Enterprise Services, Siemens Healthineers Int. LTD, Switzerland

teampay technology

At KSB, Siemens Healthineers teamplay technology plays a crucial role in managing and optimizing operations. It enables the measurement of key operational metrics, such as equipment utilization, process times in different dimensions and referral numbers. Cost control is thus actively possible for efficiency optimization. The radiation protection requirements can also be mapped via teamplay,

across all sites. This contributes to the improved use at all locations and ensures that patients receive timely, local appointments. Furthermore, teamplay enables identical and centrally optimized protocols across all devices, further enhancing the quality and safety of patient care.



Figure 4: Dashboard Radiology

Siemens Healthineers syngo Virtual Cockpit

Another innovative solution in use at KSB is Siemens Healthineers syngo Virtual Cockpit. KSB even received the Digital Economy Award 2023 in Switzerland for this solution. KSB had previously applied teleradiology as a standard solution for reports. Since 2023, remote scanning supplements the daily operations in the hub and the referring spokes. This technology allows technicians to remotely operate equipment at different locations.

For example, a radiology technician controls and runs up to three MRI scanners from the workstation at other sites. One significant advantage is the improvement of timely and consistent care for patients. The technical setup enables KSB performing even advanced or specialized diagnostics at every point of the KSB network, at locations closest to patients. In terms of efficiency, Virtual Cockpit allows for the flexible allocation of expertise.

Remote specialists can assist with multiple cases across different locations, increasing overall productivity. The system contributes to cost savings by reducing the need for specialists to travel, saving both time and expenses. Lastly, Virtual Cockpit promotes quality assurance by ensuring correct imaging procedures and adherence to established protocols, thereby improving the overall quality and accuracy of diagnostic results.

“This is a concrete example of how digitalization and telemedicine create added value. Decentralization and services close to home are promoted. The project has also proven its worth in terms of quality and patient safety.”

Adrian Schmitter, CEO at Kantonsspital Baden AG



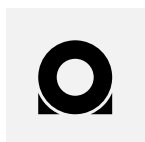
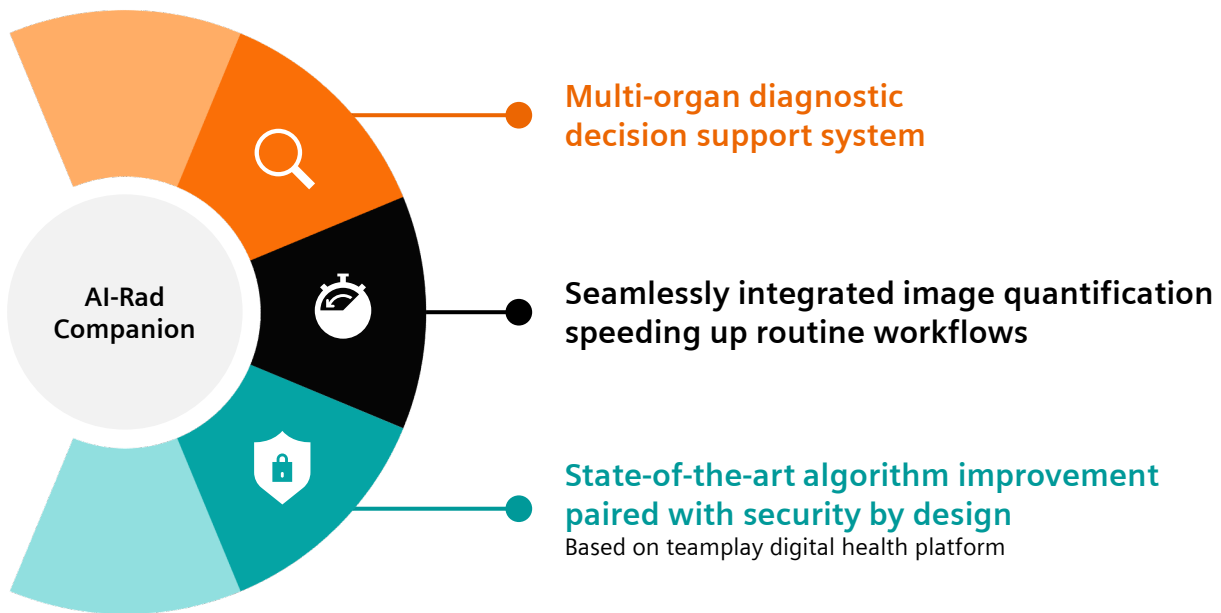
Figure 5: Workstation of the Virtual Cockpit

Artificial intelligence

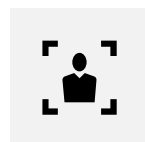
Artificial intelligence is enabling ever more precise diagnoses and treatment recommendations. At KSB, the AI-Rad Companion from Siemens Healthineers and other AI-supported software tools are used to optimize the diagnostic workflow, summarize key quantitative measurements and increase diagnostic confidence of radiologists.

The ever-increasing workload for radiologists and the increasing data volumes per patient always carry the risk of missing information and wrong decisions. AI support and computer-assisted diagnosis are powerful tools to increase radiology efficacy. They offer significant support both during the night shift and at peak times.

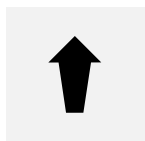
The automated recognition of significant imaging finding, e.g. pneumothorax, as well as the capability to automate time-consuming tasks, e.g. lesion segmentation, help to identify clinically relevant cases as well as to tackle the increasing demand for diagnostic imaging. This is especially important during night shifts and in the light of current and future staff shortages.



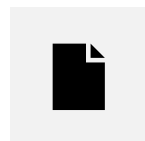
Multi-modality coverage
For CT,MR, X-ray



Multiple body regions and organs
e.g., Chest, Brain, Prostate



Automation through advanced functionalities
e.g., Segmentation, Measurement



Seamless workflow integration

Figure 6: The AI-Rad Companion

Efficiency / profitability

Profitability in hub and spoke models is essential and requires careful planning, clear agreements, effective communication, and a shared commitment to achieving common objectives. When executed effectively, cooperation provides a win-win situation for all parties involved, leading to increased financial gains and sustainable success.

At KSB for example, economies of scale can be achieved by the efficient allocation of personnel, back office and IT resources as well as streamlining purchasing processes and the resource saving use of technology from the Value Partnership with Siemens Healthineers.

At the same time, costs can be reduced through active management of patient flows by making only certain, selected diagnostics available at the hub or spokes. Thus, no high-end equipment is purchased that is then only partially utilized because the corresponding number of patients is missing.

To ensure that the operation of the hub and spoke model is profitable in the long term, key performance indicators (KPIs) have been defined and are measured on a regular basis.

Personnel and staff shortages

The KSB (hub) provides strong personnel and professional support, e.g., organ specializations, training, radiation protection, standard operating procedures (SOPs). Since personnel participates in night and weekend shifts, 24/7 operations can be ensured. The KSB also promotes continuous professional development of staff by rotating between the hub and the spokes while offering training on a regular basis.

Staff and skill shortage can be alleviated using virtual collaboration models in the hub and spoke network. Additionally, the centrally controlled patient flow and high degree of digitization and automation of processes counteracts the shortage of specialist staff.

Technical tools like the Virtual Cockpit and other innovations attract potential radiologists and radiographers and retain employees. On the one hand, it gives technical support and safety by medical standardization in daily operations and on the other hand, it underlines that KSB is an employer with state-of-the-art infrastructure.

Research with partners like Siemens Healthineers and the referring publications open the door for interested candidates as well. Furthermore, the hub-educated staff can be motivated by offering concrete career development plans, e.g., by taking leading and / or expert positions in the spokes.

“Today, employees pay close attention to the extent to which employers deal with and use new technologies. In addition, actively helping to shape the future can greatly motivate employees and increase loyalty to the hospital,”

Jana Petersik, Zone Business Lead Interventional Radiology & Cardiology CWE

Success factors for cooperations in hub and spoke models in radiology:

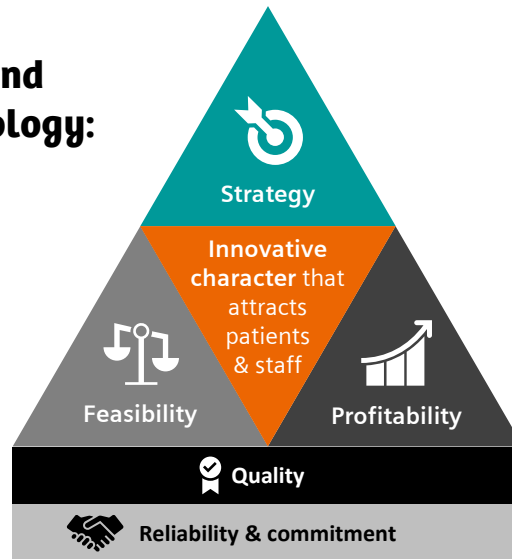


Figure 7: Success factors for cooperations in hub and spoke models



1. Strategy

Clear objectives and alignment of goals

- Clearly define the objectives and goals of the collaboration, ensuring that the entire team has a shared understanding of what it aims to achieve.
- Create a win-win situation in the hub and spoke model by offering complementary capabilities (e.g., the hub offers radiology services while a spoke offers rehabilitation services)



2. Feasibility

Interoperability and data sharing

- Implement interoperable systems and standards to facilitate seamless data exchange and collaboration between different healthcare entities
- Ensure the security and privacy of patient data through robust data governance practices



3. Innovative character

Technology partnerships and innovation strategy

- Setting up a formal partnership with Siemens Healthineers allowed the KSB to sustainably plan or adapt the needs in terms of equipment and technology
- Bring in the technology partner to help technical operations, thus enabling full focus for the hospital on highest standards for clinics



4. Profitability

Measurable outcomes and continuous improvement

- Define KPIs and metrics to measure the success of the hub and spoke model
- Establish a feedback loop for continuous improvement, allowing the team to learn from successes and challenges



5. Quality

Standardization and unified SOPs

- Define standardized and uniform processes across all sites
- Ensure high diagnostic quality by access to organ specialization



6. Reliability & commitment

Collaborations and partnerships

- Ensure mutual respect and commitment of the entire team
- Collaborate with industry and other institutions in healthcare

Conclusion

The hub-and-spoke model of the Institute of Radiology at KSB offers numerous benefits. It ensures patient care close to home while meeting the high-quality standards of a large hospital. Moreover, access to all relevant patient information enables comprehensive medical care. By optimizing staff deployment, the model addresses the shortage of skilled professionals while efficiency gains lead to significant cost savings.

Thus, this model represents a significant advancement in the provision of radiology services, benefiting both patients and medical staff. Furthermore, the model contributes to a more sustainable and resilient healthcare system by optimizing services and reducing patient and staff travel.

This is the last paper of our series “Radiology of the Future”. With this series of four compact and explicitly practice-oriented publications, we hope to shed light on the various topics and changes in radiology and make them accessible to the reader. We have chosen Networked Care, Value-based Radiology & Patient Journey and Patient Experience & Healing Infrastructure as the main topics.

Publications can be read and understood individually, and together, the series provides a holistic picture of current trends in radiology.



About the authors



Adrian Schmitter
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Adrian Schmitter has been CEO of Kantonsspital Baden for over ten years. He completed an engineering degree as an agronomist and studied law and economics at the Universities of Neuchâtel and Freiburg. During his career, he drove innovation in different positions in the healthcare sector. From 2001 to 2010, he was Secretary General of the Department of Health and Social Affairs in the Canton of Aargau, before becoming CEO at Emmental Hospital. In addition to his function as CEO at Kantonsspital Baden, he has held and continues to hold several board memberships. His focus lies on implementing innovative ideas that ultimately serve society and patients.



Prof. Dr. Rahel Kubik
Head of the Institute of Radiology, KSB

Professor Rahel Kubik is Head of the Institute of Radiology, Chair of the Department of Medical Services, and a member of the executive board at Kantonsspital Baden in Switzerland, a teaching hospital affiliated with the University of Zurich and the Swiss Federal Institute of Technology (ETH Zurich). She trained at the Rockefeller University Hospital in New York and at University Hospital Zurich, and earned her medical degree, doctorate, and habilitation from the University of Zurich. She received a Master of Public Health (MPH). She has a strong interest in female imaging with expertise in all imaging modalities and image-guided minimally invasive breast interventions, as well as management topics and research.



René Heule
Department Manager of Medical Services, KSB

René Heule is currently Department Manager of Medical Services at Kantonsspital Baden. He has financial responsibility in the areas of radiology, nuclear medicine, pathology, rheumatology, therapies, and the hospital pharmacy. Since 2008, he has been contributing his experience from industry, the public sector, and the transport sector in various functions in the healthcare sector. In 2007, he successfully completed the Executive Master of Finance at SMP St. Gallen. His focus is on the strategic development of hospitals, process optimization, and change and corporate management.



Lara Herzog
Project Lead Consulting, Siemens Healthineers AG (SHS)

Lara Herzog has over six years of experience in management consulting and joined Siemens Healthineers in 2021. Having worked in a multitude of consulting projects over the years, she brings expertise in the areas of strategy development, transformation, process optimization, implementation, and global rollouts, as well as project management. In her current position, she focuses on the digital healthcare sector. Lara holds a master's degree in industrial engineering and management with focus on biomedical technology and health economics from the Technical University of Berlin.



Jana Petersik
Zone Business Lead Interventional Radiology & Cardiology Central Western Europe, SHS

Jana Petersik joined Siemens Healthineers in 2019 as Consulting Partner and Head of Global Practice Clinical Operations. Currently, Jana leads the Interventional Radiology & Cardiology business in Central Western Europe. Prior to joining Siemens Healthineers, Jana worked 10 years for TÜV NORD where she held a number of leadership positions in the field of industry. As Lead Auditor for Quality Management Systems in combination with several positions in hospitals she is used to the entire processes along and in hospitals as well as healthcare systems. Jana has a degree in economics, specializing in healthcare and public sector management, from the University of Augsburg.



Frédéric Schoenahl
Head of Enterprise Services Switzerland, SHS

Frédéric Schoenahl is currently managing the Enterprise Service business in Switzerland and deals with strategic partnerships for Siemens Healthineers. He came to Siemens Healthineers in 2006 as an EMEA expert in sales and collaborations in molecular imaging and has served various roles from Northern Europe to Western Africa. In Switzerland, he acted as key account management lead and was an architect of the value partnership at KSB. He received biomedical and signal processing degrees in Germany and France, with a major in medical functional imaging. He holds a multidisciplinary PhD from the University of Geneva and the University Hospital of Geneva, in medical physics, medical instrumentation, and computer science.

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- ⁵ KSB City, Medizinisches Zentrum Brugg, Ärztezentrum Limmatfeld, ASANA Leuggern, Paul Scherrer Institut (PSI)
- ⁶ Since the radiology site in Leuggern is located in a regional hospital with 24/7 emergency services for the local population

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The outcomes achieved by the Siemens Healthineers customer described herein 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 others will achieve the same results.

The scientific overlay on the title is not that of the individual pictured and is not from a device of Siemens Healthineers. It was modified for better visualization.

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