

The Digital Transformation of Hospitals: A Foresight Study of Digitization Trends

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Background

In the context of the digital transformation of all areas of society, healthcare providers are also under pressure to change. New technologies and a change in patients' self-perception and health awareness require a rethink in the provision of healthcare services. New technologies and extensive use of data can change provision processes, optimize them or replace them with new services. The inpatient sector, which accounts for a particularly large share of healthcare spending, plays a major role in this regard. This study examines the influences of current trends in digitization on inpatient service delivery.

Methodology

We conducted a narrative review. This was applied to identify the international trends in digital transformation as they relate to hospitals. Future trends were considered from different perspectives. Using defined inclusion criteria, international peer-reviewed articles published from 2016 to 2021 were selected. The extracted core trends were then contextualized for the German hospital sector with 12 experts. A heuristic impact model of the trends was derived from the data obtained and the experts' assessments. It provides a development corridor for the interaction of the trends with regard to technology intensity and supply quality. Trend accelerators and barriers were identified.

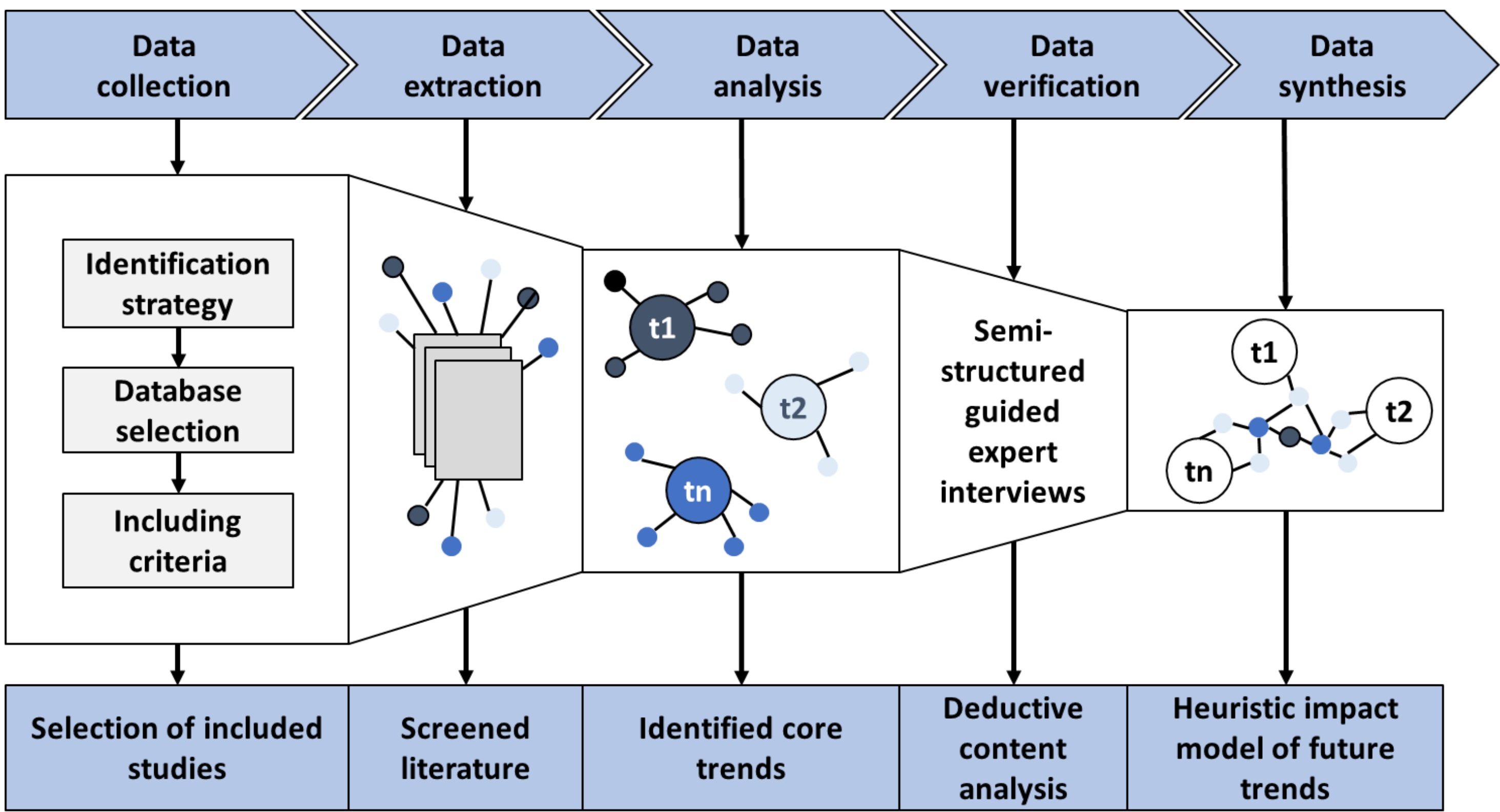
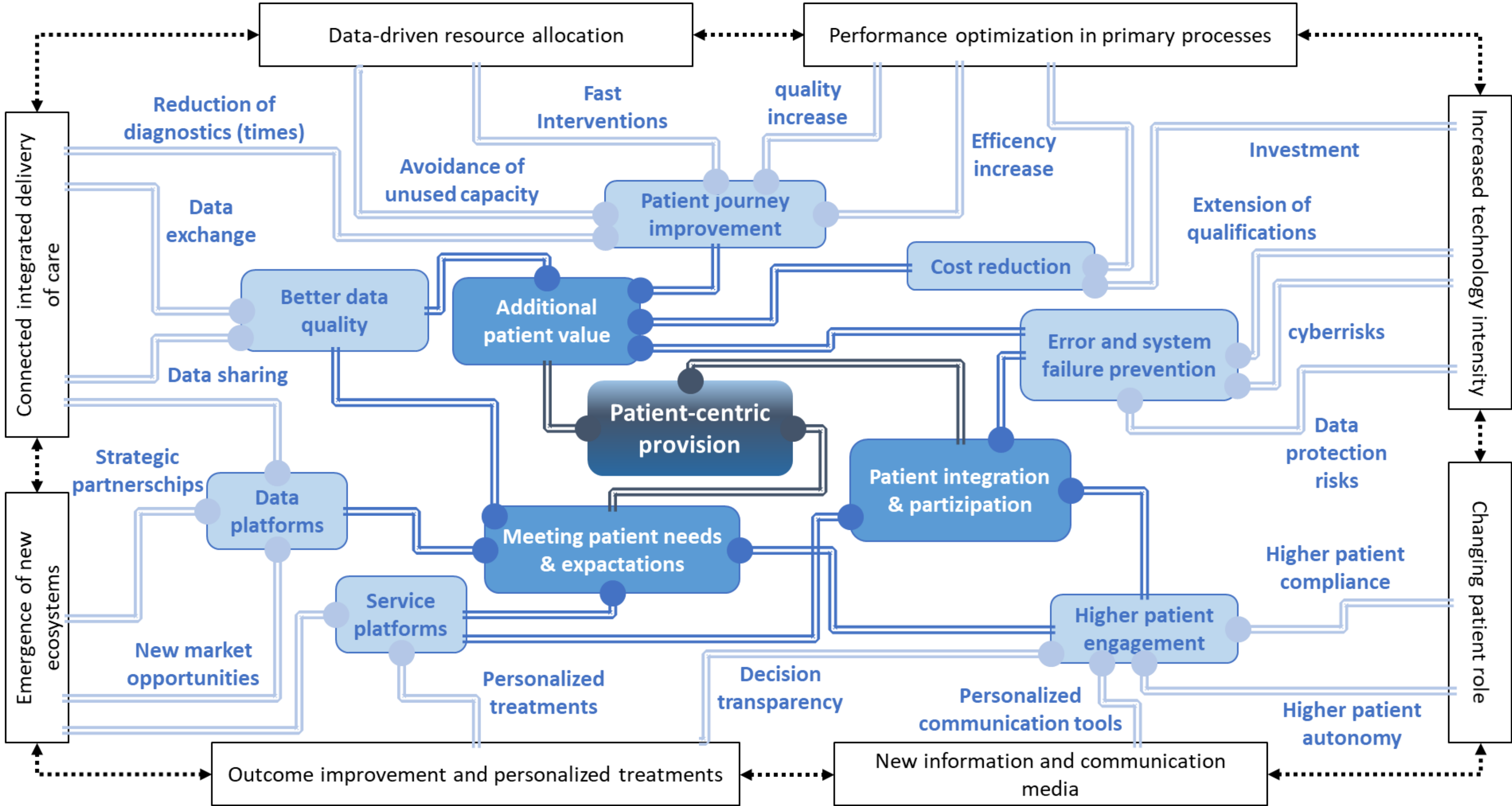


Figure 1: Methods of the study

Results

Table 1: Effects and framework conditions of the core trends

#	Core-trend	Description	Key Technologies	Positive effects	Negative effects	Prerequisites	Trend drivers
1	Changing patient role	Patients have an active role in the entire care process. They participate in decision-making processes and have comprehensive transparency of their own data and available services.	Internet, smart devices, mobile health	- Increasing transparency - Growing patient autonomy - Better participation opportunities - Growth of self-competence	- Risk of disinformation - Overwhelming media diversity	- Trust in institutions - Public provision of information - Comprehensive education	- Health literacy - Digital competencies - Information access
2	Connected integrated delivery of care	Service providers collaborate without sector barriers. They are connected to each other and provide all necessary diagnostic and therapeutic information to one another.	EHR, smart devices, IoT, ePrescription	- Better access to services - Faster data exchange - Reduction of interface problems	- Additional competitive pressure between providers	- Performance incentives - Adjustment of reimbursement systems - Data exchange interfaces	- Easy market access - Existing supply gaps - Integrated planning tools
3	Data-driven resource allocation	The capacities of service providers are optimally utilized. They analyze real-time data and make decisions based on currently available resources beyond their own institution.	Big data, machine learning, data mining, EHR, HIS, predictive analytics	- Increasing efficiency - Optimal use of resources - Compensation of shortages of skilled workers	- Dependence on service providers - Data protection risks - Increasing complexity	- Data availability - Interface availability - Specialist availability	- Scarce resources - High data density - Public data platforms
4	Performance optimization in primary processes	Hospitals manage their internal processes efficiently and patient-centric. They use technology to support staff in diagnostics and therapy decisions.	EHR, robotics, IoT, machine learning, data platforms	- Efficient provisioning - Increasing quality - Higher satisfaction (patients and staff)	- Dependencies of many factors - Constant change process	- Investments in new systems - Acceptance of new processes - Permanent qualification	- Medical progress - Decreasing costs - New professions
5	New information and communication media	Service providers are broadening the range of information and communication channels. They create interactive and low-threshold ways to convey information and meet patients' communication needs.	Avatars, virtual reality, augmented reality, EHR, mobile health, IoT	- Meeting the needs of patients - Reduction of communication barriers - Improving the availability of information - Higher satisfaction	- High expenditure for maintenance and provision of the media - Additional need for qualification	- Acceptance of the parties involved - Know and understand needs - Quality assurance	- Digital skills (patients and staff) - Demand for contemporary media from everyday social life
6	Increased technology intensity	Hospitals are deploying an increasing number of technological solutions. They are exploiting the potential of innovative technical applications and raising the level of technology complexity.	Smart devices, IoT, robotics, machine learning, cloud services	- Achieving productivity advances - Compensation for lack of skilled workers - Relief of the workforce	- High effort for cyber security - Increasing complexity - Need for technical knowledge	- Extensive investments - Comprehensive qualification - Acquisition of new areas of knowledge	- Technical progress - Patient expectations
7	Outcome improvement and personalized treatments	The outcome of patient care is steadily improving. Early detection and disease prediction systems enable an optimal treatment sequence according to the personalized needs of the patient.	Big data, machine learning, predictive analytics, personalized medicine, 3D print	- Increasing outcome - Development of new service areas - Opportunities for specialization	- Adjustment of the business model	- Data quality and availability - Market maturity of technologies - Confidence in new treatment procedures	- Medical progress - Technical progress - Competitor offer
8	Emergence of new ecosystems	Service providers are linked together in an ecosystem to provide care. They use platforms to exchange data and optimally allocate services to the right place at the right time.	Digital platforms, mobile health, machine learning, predictive analytics	- Creation of customer-centric proposals - Exploiting the potential of the platform economy - Increasing customer value	- High competitive pressure - Inappropriate market power of some players - Inadequate regulation	- Understanding digitally controlled ecosystems - Transparency of the service offering - Fair conditions on platforms	- Low barriers to market entry - Minimal regulation - High customer interest/demand



We included 44 articles in the literature analysis. The analysis shows the dependencies of a successful digital transformation for the hospital sector. While data interoperability is of particular importance for technology intensity, the changed self-image of patients is shown to be decisive with regard to quality of care. We show that hospitals must find their role in new digitally driven ecosystems, adapt their business models to customer expectations, and use up-to-date communication and information technologies.

References



Figure 2: Heuristic impact model of digital transformation trends in hospitals

Take Away Message

Digitization has the potential to transform inpatient healthcare in a sustainable way by supporting a patient-centered high-quality care while redefining roles of service delivery.



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