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ATLAS
DIGITALE GESUNDHEITSWIRTSCHAFT

Artificial Intelligence in Healthcare Marketing

Opportunities and Challenges Along the Patient Journey

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Executive Summary

Healthcare marketing is evolving from an information channel into a strategic management instrument along the patient journey.

Increasing digitalization means that the different phases of the patient journey can no longer be viewed in isolation. Healthcare marketing is becoming a central instrument for ensuring consistent communication, service processes, and patient experience across all stages.

AI enables data-driven, context-specific patient communication.

AI integrates diverse data from interactions, communication, processes, and usage behavior, translating them into personalized content, automated interactions, predictions, and streamlined processes. Communication thus becomes context-driven rather than standardized.

The value of AI emerges across the entire patient journey.

From prevention and information search to access, treatment, and aftercare, AI supports multiple interaction points. Connecting these applications enables consistent patient support and fosters long-term relationships.

AI shifts the focus from reactive communication to proactive support.

Through data analysis and predictive modeling, information needs, support requirements, and patient behavior can be identified at an early stage. Healthcare organizations can thus provide relevant services before specific issues arise.

The successful use of AI depends on appropriate governance structures.

Technological capabilities alone do not ensure successful AI implementation. Issues such as data quality, data security, transparency, and ethical responsibility must be addressed within an AI governance framework, as they are critical for mitigating risks, building trust, and ensuring the responsible long-term use of AI.

1. Healthcare Marketing in Transition – New Requirements for Organizations

Increasing competition, a growing shortage of skilled professionals, and ongoing digitalization are fundamentally reshaping the operating environment of healthcare organizations (Agarwal et al. 2020). At the same time, patients are increasingly acting as informed and self-determined decision-makers who expect transparent information, easy access to healthcare services, and personalized communication (Anderson et al. 2019). Patient interactions are distributed across a wide range of digital and physical touchpoints. As a result, healthcare organizations must design the entire process—from prevention and treatment to aftercare—as an integrated patient journey and align communication and service processes accordingly (Carayon et al. 2020).

Against this backdrop, healthcare marketing is gaining strategic importance: it is evolving from a purely informational function into a key instrument for competitive differentiation (Moorman et al. 2024). At the same time, the increasing availability of digital data is opening up new opportunities for the data-driven management of marketing and communication processes. Artificial intelligence (AI) is emerging as a key technology, enabling organizations to analyze large volumes of data, better understand patient behavior, personalize communication, automate service processes, and create content more efficiently (Bhuyan et al. 2025).

However, many healthcare organizations still face significant uncertainty regarding the strategic positioning, practical value, and organizational implementation of AI in marketing. In addition to economic considerations, issues such as data protection, ethical responsibility, and trust play a central role. Healthcare leaders are therefore challenged to systematically assess the opportunities and risks associated with AI and to establish appropriate frameworks for its responsible use.

Against this background, this whitepaper examines the use of artificial intelligence in healthcare marketing from a management perspective. Its objective is to identify key application areas of AI along the patient journey, analyze their potential benefits for healthcare organizations, and highlight the main challenges associated with their implementation.

2. AI as a Strategic Driver Along the Patient Journey

AI in Healthcare Marketing

AI in healthcare marketing refers to the use of learning algorithms that analyze data from patient interactions and derive decisions for communication and service processes, as well as generate content (see Figure 1). Unlike traditional marketing automation, which relies on predefined rules and standardized workflows, AI enables the dynamic adaptation of communication and processes to the respective usage context (Bhuyan et al. 2025).

With increasing digitalization, data is continuously generated across apps and websites, patient portals, service interactions, and social media, which can be leveraged for AI applications (Kuwaiti et al. 2023). These can be grouped into four main types:

- Interaction data (online usage behavior; contact inquiries)
- Communication data (text and voice content)
- Process and organizational data (appointments, capacity utilization, no-shows)
- Health and behavioral data (e.g., from prevention and monitoring applications)

In processing this data, AI plays a central role in healthcare marketing by transforming individual interactions into actionable insights. Technologically, this approach is primarily based on machine learning methods for pattern recognition and prediction, as well as natural language processing for handling human language. Generative AI further extends these capabilities by enabling the automated creation of content (Weingott and Parkinson 2025).

On this basis, analysis and pattern recognition first make recurring relationships within patient interactions visible. These insights allow interactions to be assigned to specific target groups and usage contexts, enabling communication to be tailored accordingly. Building on this, predictive modeling enables a forward-looking assessment of future needs and behavioral probabilities, allowing information and service offerings to be provided proactively.

The insights derived from this process ultimately feed into the generation and orchestration of content. The output of these AI functions can be grouped into four key areas:

- Personalized content (text, audio, images, videos)
- Automated interaction (chatbots, voice-based assistants)
- Predictions (demand and adherence forecasting)
- Process automation (appointments, reminders, follow-ups)

On this basis, AI becomes a central mechanism for delivering communication tailored to patients, enabling consistent interaction across the entire patient journey (Olawade et al. 2024).

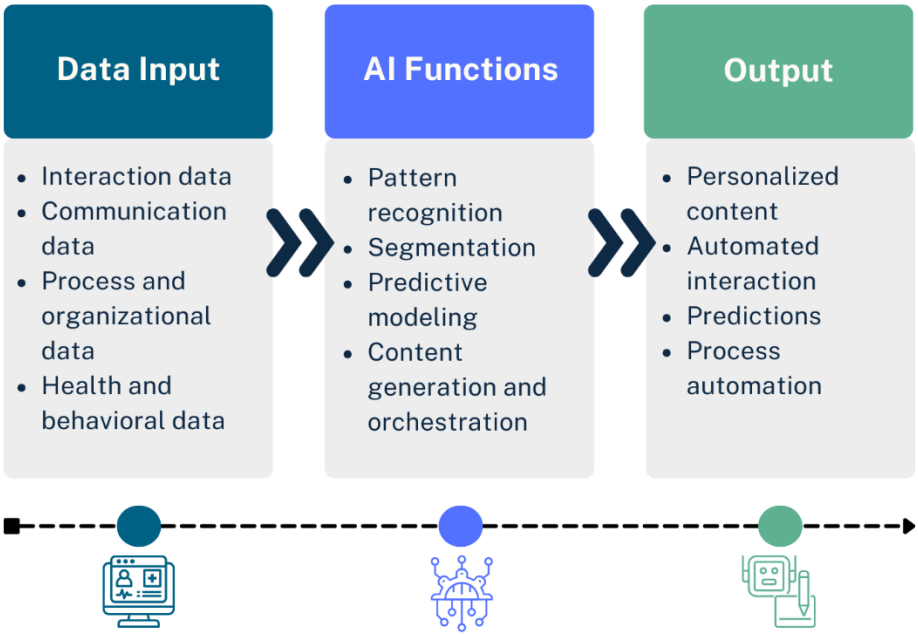


Figure 1: Data Input, AI Functions, and Output in Healthcare Marketing

The Patient Journey – From Prevention to Aftercare

The patient journey encompasses far more than the actual clinical encounter (Danaher and Gallan 2016). It begins in people's everyday lives and covers the entire pathway from prevention through orientation and information search, access and appointment scheduling, preparation and treatment, to aftercare and long-term health management (Carayon et al. 2020; Maas et al. 2024). The patient journey can be understood as a cycle, as aftercare and long-term health support feed directly back into preventive measures (see Figure 1).

For healthcare organizations, this means that marketing and communication can no longer be designed in isolation at individual touchpoints, but must be aligned across the entire patient journey. The goal is to support patients with relevant information and appropriate service offerings in different situations, while fostering long-term relationships (Moorman et al. 2024).

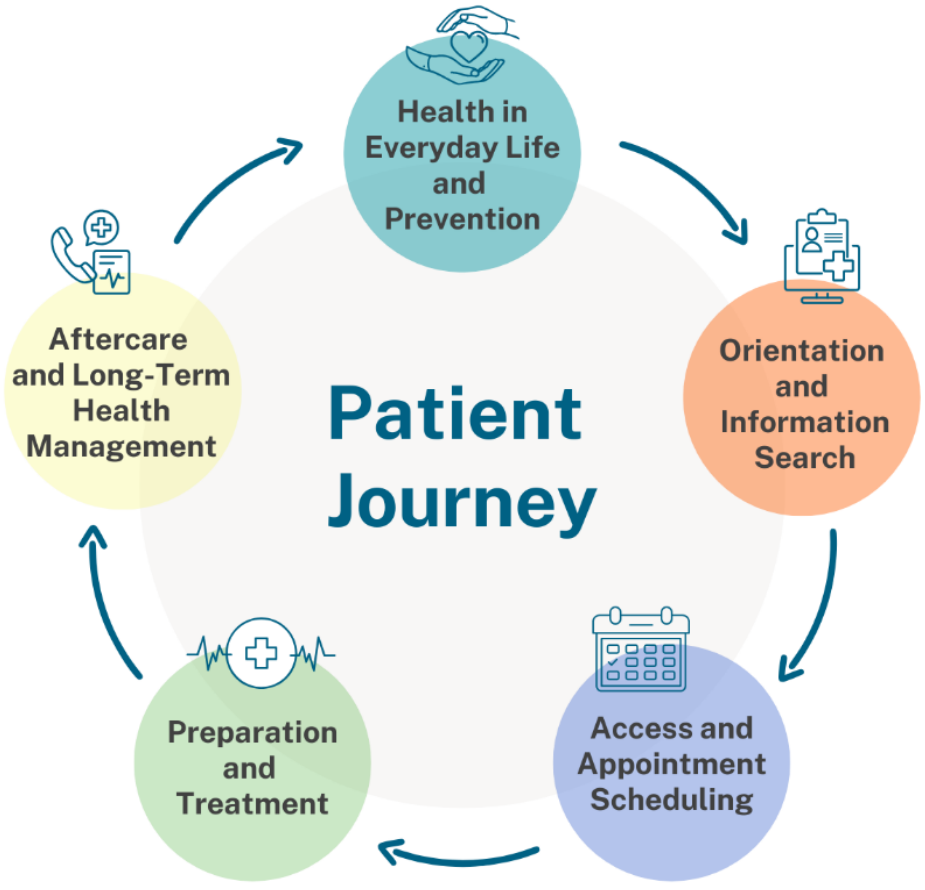


Figure 2: The Five Phases of the Patient Journey

Patients move between a range of physical and digital touchpoints—such as apps or websites, brochures, patient portals, telephone, video consultations, or social media (Maas et al. 2024). An omnichannel strategy aims to integrate these interactions across channels and combine them into a coherent patient experience (Moorman et al. 2024). Information from different touchpoints is brought together so that patients can continue their interactions without disruption, while healthcare organizations gain a comprehensive view of the patient journey. Such integrated communication can improve patient satisfaction, engagement, and access to healthcare services (Moreira et al. 2023).

In this context, AI plays a central role, as it can consolidate and analyze large volumes of interaction data from multiple channels. It enables organizations to understand communication pathways, identify preferences, and adapt content to specific situations. This allows for personalized and consistent patient communication (Bhuyan et al. 2025). The concrete value of AI becomes particularly evident in the design of interactions along the entire patient journey, which are analyzed in Chapter 3.

3. Application Areas of AI Along the Patient Journey

3.1 Health in Everyday Life and Prevention

The patient journey begins in people's everyday lives, where health is initially perceived as a matter of prevention. Health portals, social media content, or prevention campaigns often represent the first point of contact between healthcare organizations and potential patients. At this stage, the focus is less on the utilization of specific healthcare services and more on promoting health-conscious behavior (De la Torre et al. 2025).

AI enables healthcare organizations to address this phase more effectively by continuously adapting information offerings to current topics, target group needs, and usage contexts. AI-based content creation supports the preparation of accessible health information and the tailoring of content to different age or risk groups. For example, Schmälzle and Wilcox (2022) demonstrate how AI can be used to automatically generate social media content for health education, illustrated by campaigns on the importance of folic acid.

In addition, AI-supported technologies such as wearables are increasingly emerging, allowing health-related prompts to be more closely integrated into everyday life and enabling prevention to be understood as an ongoing process (Obianyo et al. 2024). This creates new touchpoints between healthcare organizations and patients, supporting continuous engagement with health and forming the basis for individualized communication offerings.



Case Example: AI-Enabled Wearables

Wearables (portable digital devices) continuously collect health-related data and provide users with immediate feedback on their health behavior. Through AI-driven analysis, individual patterns can be identified and personalized recommendations for prevention can be provided. As a result, prevention becomes more event-driven and needs-based (Obianyo et al. 2024).

Particularly in the context of chronic conditions, continuous monitoring can help detect changes at an early stage and support preventive interventions. Wearables thus serve as an interface between prevention, self-management, and long-term patient communication. From the perspective of healthcare organizations, this shifts the focus from reactive treatment to continuous support throughout patients' everyday lives (Kuwaiti et al. 2023).

3.2 Orientation and Information Search

When experiencing health concerns, patients increasingly research symptoms and potential causes, compare treatment options, and seek information about providers, services, and diagnostic possibilities (Bhuyan et al. 2025). For healthcare organizations, the challenge is to provide relevant information in a clear and timely manner in order to support patients in a situation often characterized by uncertainty.

AI enables organizations to better tailor information offerings to individual needs. In addition, interaction patterns can indicate increased demand for information or support, allowing healthcare organizations to proactively surface relevant content and guide patients more effectively toward appropriate information or care options (Yelne et al. 2023).

Beyond personalized content, AI-based interaction systems such as chatbots support patients by answering frequently asked questions and facilitating navigation within digital platforms. The aim is to reduce uncertainty and inform patients about the next steps in their care journey (Thorat et al. 2024).



Case Example: AI-Based Identification and Targeted Outreach for Patients with Rare Diseases

Due to low case numbers and often non-specific symptoms, many individuals with rare diseases receive a correct diagnosis only at a late stage. AI is increasingly being used to identify affected patients earlier and engage them in a more targeted manner (Visibelli et al. 2023).

Based on interaction data—such as searches for specific symptoms, visits to specialized information websites, or repeated contact inquiries—predictions can be made about which patient groups are most likely to benefit from particular information or care offerings. In addition, natural language processing enables the analysis of unstructured medical data to support the early identification of potential at-risk patients (Wojtara et al. 2023).

Building on this, personalized communication strategies can be developed, for example through tailored information offerings, automated guidance on diagnostic options, or targeted campaigns for specialized treatment centers. Such AI-driven approaches can significantly improve information uptake and engagement among patients with rare diseases (Pan 2025).

3.3 Access and Appointment Scheduling

The transition from the information phase to the actual use of healthcare services represents a critical moment in the patient journey. Organizational barriers, limited accessibility, or unclear responsibilities can result in appointments not being scheduled or treatments being delayed. In this phase, AI supports healthcare organizations in simplifying access processes and improving the efficiency of administrative workflows (Knight et al. 2023).

For example, AI-enabled systems allow for intelligent appointment scheduling by taking into account available capacity, expected demand, and typical no-show patterns in order to allocate appointments more effectively and optimize resource utilization. At the same time, digital pre-assessments or structured intake processes can be used to classify patient needs at an early stage and direct them to the appropriate departments or services. In addition, automated communication processes—such as appointment confirmations, adaptive reminders, or preparatory information—support the reliable organization of care pathways (Olawade et al. 2024).

Voice-based AI systems are also becoming increasingly important in this context, as they can structure telephone inquiries and improve accessibility beyond regular operating hours. Overall, the use of AI helps reduce access barriers, ease administrative burdens, and provide patients with a smoother entry into the healthcare system.



Case Example: Predicting Appointment No-Shows

Missed appointments (“no-shows”) represent a significant organizational and economic challenge for healthcare organizations. In addition to unused capacity, they result in longer waiting times for other patients and increased administrative effort.

AI-based models enable the prediction of no-show risk based on data such as previous attendance behavior, the time interval between booking and appointment, and organizational conditions (Liu et al. 2022).

Based on these insights, healthcare organizations can implement targeted measures, such as personalized reminders, alternative appointment options, or prioritized outreach to patients with a higher risk of non-attendance. Studies show that such AI-driven interventions can improve appointment adherence while increasing the utilization of healthcare resources (Chong et al. 2020; Liu et al. 2022).

3.4 Preparation and Treatment

In preparation for treatment, patients are often confronted with new procedures and complex medical information. AI supports healthcare organizations in aligning information and communication processes more closely with the specific treatment context and in guiding patients through this phase in a targeted manner (Goldschmitt et al. 2025).

AI-based systems enable the provision of preparation instructions and informed consent information tailored to the situation, as well as the clear summarization of complex medical content. Information can be adapted to the type of treatment, the stage within the care process, and individual information needs.

AI is also increasingly transforming communication during treatment itself. For example, voice-based systems can document clinical conversations, allowing healthcare professionals to focus more on direct interaction with patients. This creates more space for personal communication, while documentation tasks are supported through automation (Gross et al. 2025).

In addition, the integration of large language models into physical service robots further expands the possibilities for patient-centered communication. Such systems can explain medical information in accessible language, answer questions about treatment procedures, and provide emotional support through empathetic dialogue (Wirtz and Stock-Homburg 2025).

Furthermore, interaction and behavioral data can be used to detect deviations from recommended care pathways at an early stage and to support patients in a targeted way. Overall, the use of AI helps reduce uncertainty and enables consistent support throughout the treatment process.



Case Example: AI-Supported Disclosure

AI-based systems or chatbots can automatically structure medical information, summarize it in clear and accessible language, and adapt it to different information needs. Studies show that language models can provide understandable answers to patient-related questions about medical conditions, treatment options, or surgical procedures, thereby meaningfully complementing digital patient disclosure and education processes (Goldschmitt et al. 2025).

As a result, patients can enter consultations better prepared and ask more targeted questions. AI does not replace physician-led patient disclosure, but rather supports and enhances the communication process (Stroop et al. 2024).

3.5 Aftercare and Long-Term Health Management

The patient journey does not end with the completion of treatment. Aftercare and the repeated use of healthcare services are becoming increasingly important, particularly in the context of chronic conditions and long-term health management.

AI enables healthcare organizations to provide relevant communication offerings in this phase, such as personalized aftercare information, reminders for follow-up appointments, or medication refills. In addition, AI-based support services can help patients adhere to recommended measures and re-engage with healthcare providers at an early stage when needed. This creates continuous interaction that supports patients between treatment episodes and fosters long-term patient relationships (Unanah and Mbanugo 2025).

At the same time, AI-driven analysis of patient feedback enables a better understanding of patient experiences. Healthcare organizations can use these insights to identify which information offerings are perceived as helpful and where communication processes can be improved. In the long term, this strengthens trust in the organization and promotes sustained engagement beyond individual treatment episodes (Agarwal et al. 2020).



Case Example: AI-Supported Follow-Up Communication in Aftercare

After the completion of treatment, many patients continue to have a need for information and support, for example in managing symptoms or adhering to aftercare recommendations. AI-supported follow-up systems are increasingly being used to support this phase through continuous and personalized communication.

AI-based systems automatically contact patients after treatment, collect feedback on their health status, and provide relevant information. Based on patient responses, content can be adapted, or medical staff can be involved in case of irregularities. Such AI-driven follow-up approaches can improve patients' understanding of aftercare recommendations, reduce anxiety, and at the same time lower administrative effort (Wang et al. 2025).

From a marketing and communication perspective, this creates continuous, needs-based interaction beyond the initial treatment encounter, thereby fostering long-term patient relationships.

4. Challenges and Risks in the Use of AI in Healthcare Marketing

The use of AI in healthcare marketing offers significant potential, but it is also associated with a range of challenges and risks. For professionals and decision-makers, the key challenge lies in not viewing AI solely as a technology, but as a socio-technical system that encompasses data quality, security, regulatory requirements, and ethical considerations.

Technological Challenges

Technological challenges primarily relate to data availability, data quality, and system integration. AI models require consistent, up-to-date, and sufficiently granular data from multiple sources, such as website interactions, patient portals, CRM systems, or feedback channels. In practice, however, these data are often fragmented or only partially interoperable. In addition, integration into existing IT environments is often difficult due to legacy system structures, data silos, and a lack of standardized interfaces.

Another important aspect concerns the stability of AI models. Changes in user behavior or data structures can lead to a decline in model performance over time (“data drift”). Continuous monitoring and regular model updates are therefore essential (Sahiner et al. 2023).

Cybersecurity and Data Protection Risks

Closely linked to technological challenges are cybersecurity and data protection risks. AI applications increase the attack surface, as they introduce additional systems, interfaces, and data flows. Personal health and interaction data are particularly sensitive, as they may reveal information about health conditions or individual vulnerabilities (Rogge and Bohnet-Joschko 2026).

Risks range from data breaches and ransomware attacks to misconfigurations of cloud services and specific AI-related attack scenarios, such as prompt injection in chatbots or manipulation of training data. Security requirements must therefore be considered from the outset when designing AI applications, for example through access controls, encryption, and incident response processes (Li et al. 2024).

Regulatory and Ethical Requirements

Regulatory and ethical requirements are critical for the acceptance of AI-based applications in healthcare. In addition to data protection regulations—such as purpose limitation, data minimization, and transparency—the accountable and responsible use of AI is becoming increasingly important. Patients must be able to understand the extent to which AI is involved in communication or service processes, what data is

being used, and what role automated systems play in recommendations or information provision.

With generative AI, there is an additional risk of inaccurate or misleading content, which may affect both the organization's reputation and patient safety. Transparent communication and clear explanations of AI use are therefore essential to build trust and safeguard patient autonomy (Yelne et al. 2023).

At the same time, AI-based marketing and service offerings may reinforce existing digital inequalities, as they tend to primarily reach individuals with higher digital literacy and better technical access, while other groups—such as older adults, lower-income populations, rural communities, or people with disabilities—may benefit less (Agarwal et al. 2020). Responsible use of AI therefore requires a careful assessment of target group effects and the provision of alternative access channels (Saeed and Master 2021).

AI Governance

The challenges and risks outlined above give rise to clear requirements for the organizational governance of AI (see Figure 3). AI governance refers to the set of structures, policies, and processes that ensure the responsible and controlled use of AI. Healthcare organizations need clear guidelines defining the purposes for which AI may be used, what data can be utilized, how transparency is ensured, and who is accountable for decisions and outcomes (Reddy et al. 2020).

This requires defined quality standards, structured approval processes, continuous monitoring of performance and errors, and well-documented decision-making processes (Kuwaiti et al. 2023).

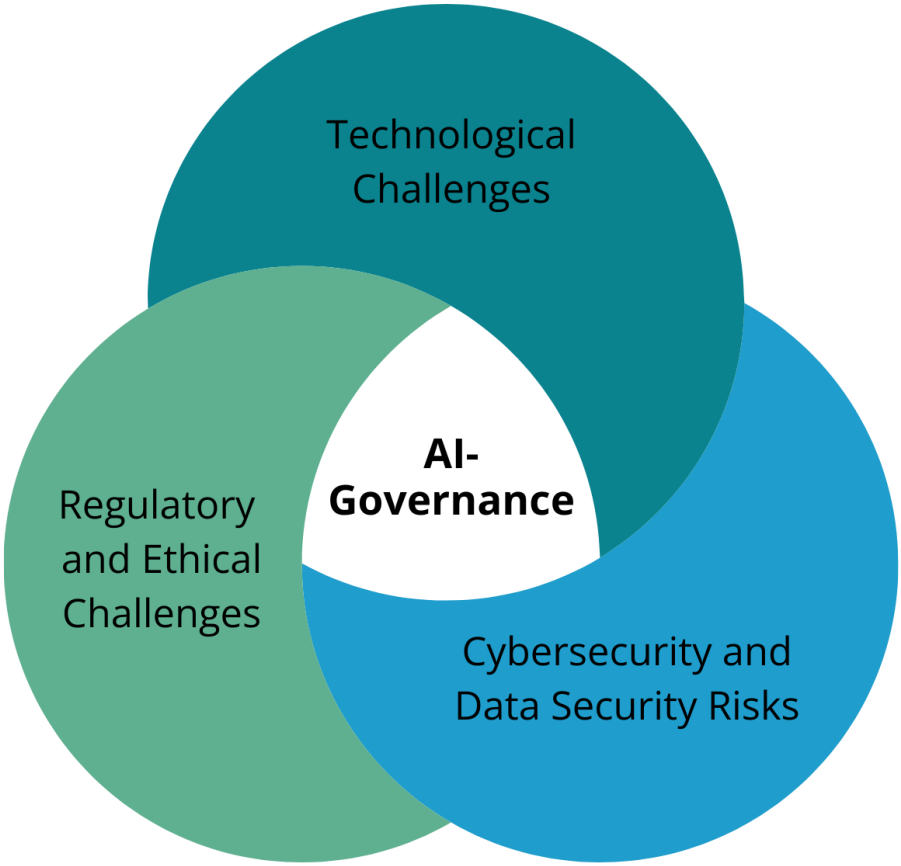


Figure 3: AI Governance as a Prerequisite for Managing AI-Related Challenges and Risks

5. Conclusion and Key Takeaways

AI is fundamentally transforming healthcare marketing. It enables healthcare organizations to design patient interactions not as isolated touchpoints, but as a connected process along the entire patient journey. The strategic value of AI lies less in individual technologies and more in its ability to integrate data, communication, and service processes.

Healthcare organizations that successfully implement AI are shifting their marketing from campaign-based communication to continuous, data-driven patient engagement. This allows them to simplify access, improve information processes, and build long-term patient relationships. At the same time, new requirements emerge in areas such as data protection, transparency, and ethical responsibility.

The key management challenge is therefore not to introduce as many AI applications as possible, but to define clear use cases, integrate data effectively, and strategically embed AI along the patient journey. Successful organizations start with well-defined applications, connect them step by step, and simultaneously establish structures for quality assurance and responsible use.

Key Takeaways

1. Healthcare marketing is becoming the continuous design of the patient journey

Healthcare marketing is shifting from isolated campaigns toward the continuous support of patients across the entire patient journey.

2. AI makes data actionable

By systematically analyzing interaction, communication, process, and health data, organizations can generate meaningful insights into patient needs, decision points, and information requirements. AI translates this data into personalized communication, automated processes, and improved decision-making.

3. The greatest value of AI emerges at the transitions within the patient journey

AI is particularly effective where patients move between phases—such as from information search to appointment scheduling or from treatment to aftercare. In these moments, AI can provide orientation, reduce organizational barriers, and ensure consistent communication.

4. AI enhances patient experience and engagement

Personalized information, intelligent appointment processes, clear patient education, and continuous follow-up communication help reduce uncertainty and build trust. Long-term patient relationships are driven by ongoing, relevant interaction rather than isolated touchpoints.

5. Responsible governance is essential for sustainable AI use

Technological capabilities alone are not sufficient. Data quality, transparency, data protection, fairness, and clear governance structures are critical in determining whether AI in healthcare marketing is accepted and able to create sustainable value.

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ATLAS ITG Project

The project “Innovation and Digital Transformation in Healthcare” (ATLAS-ITG), funded by the State of North Rhine-Westphalia through the Ministry of Economic Affairs, Industry, Climate Protection and Energy, provides science-based solutions to practical challenges in the digital transformation of the healthcare sector.

ATLAS conducts socio-scientific analyses on the impact of digitalization in the healthcare economy, connects lighthouse projects across North Rhine-Westphalia, and supports theory-to-practice transfer by summarizing current research findings and contextualizing technological innovations through use cases for health professionals.

Funded by the State of North Rhine-Westphalia:



Universität Witten/Herdecke

The ATLAS project is based at the Chair of Management and Innovation in Healthcare at Witten/Herdecke University.

Our chair’s research team focuses on economic issues within and between organizations in the healthcare sector. As a member of the Interdisciplinary Center for Health Services Research (IZVF), the chair contributes to the description, explanation, testing, and evaluation of concepts aimed at ensuring high-quality healthcare delivery.

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