State of the Industry

IBM **Institute for Business Value**

Healthcare

IBM

Contents

Executive summary

Healthcare organizations face unprecedented pressure to balance cost containment with expanding Patient/Member and Provider expectations. As digital adoption accelerates—and agentic AI emerges as a pivotal enabler—organizations must embrace an end-to-end transformation to create a holistic, patient-centered, sustainable system.

Even as medical and technological breakthroughs flourish, geopolitical complexities introduce new challenges through supply chain vulnerabilities, regulatory fragmentation, and increasingly nationalistic healthcare policies. Sustainable healthcare requires executives to strategically navigate cost optimization while delivering personalized care in a diverse, politically influenced global landscape.

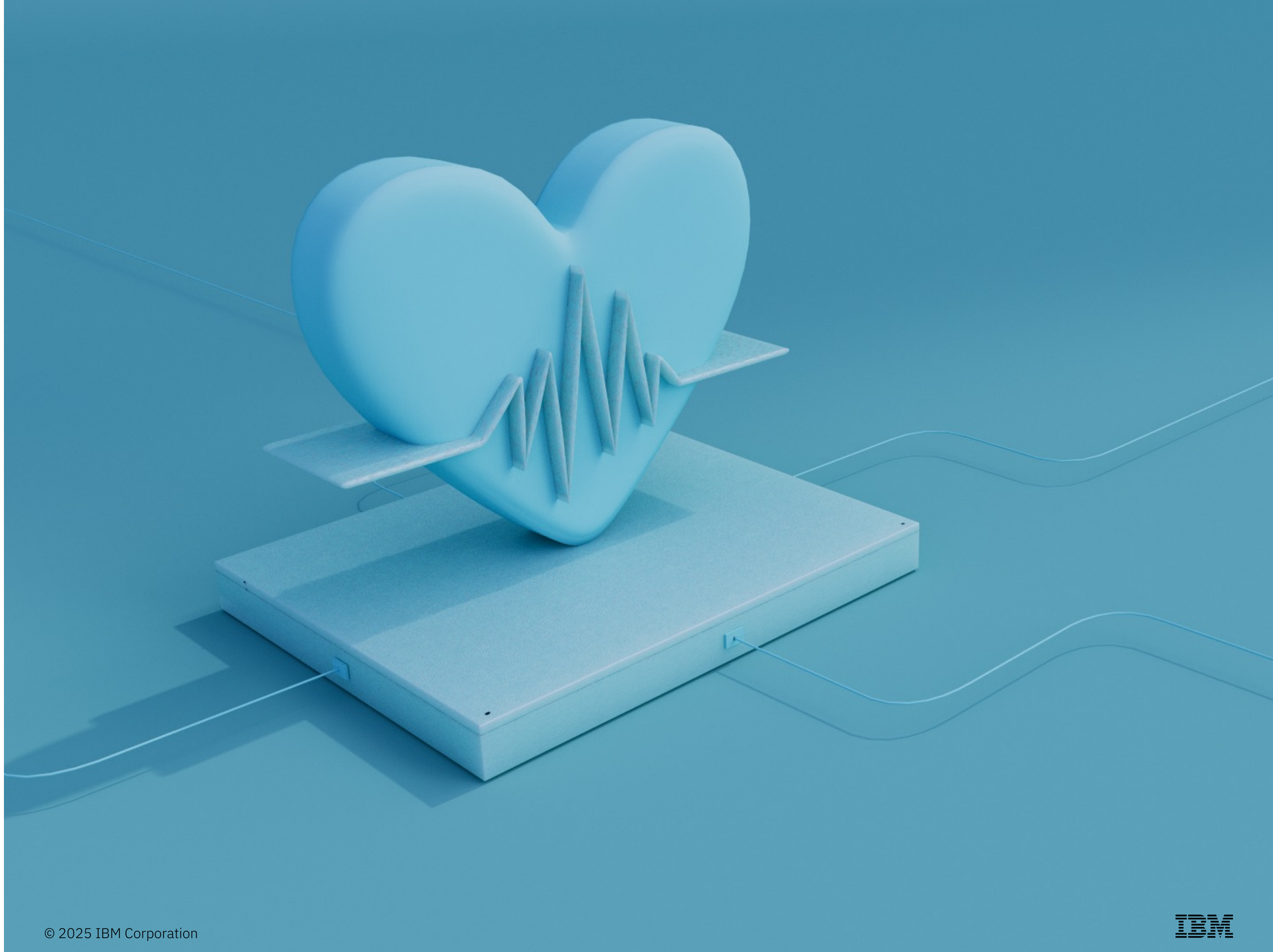
Based on research from IBM Institute for Business Value studies and the expertise of our industry leaders, we offer a high-level view of the healthcare industry today with a focus on the impacts of major technologies. Select case studies demonstrate how companies are successfully using advanced technologies to improve operations and the patient experiences.

As the demand for personalized care grows, organizations must balance cost management with delivering high-quality, patient-centered solutions in an increasingly fragmented global landscape.

To stay ahead, organizations are harnessing the power of technologies—including data analytics, digital health solutions, and AI—to drive breakthroughs in healthcare and adapt to geopolitical disruptions.

These technologies enable faster innovation, real-time medical decision-making, and more agile responses to emerging challenges.

Market & technology trends



Healthcare is moving toward a patient centric accountable care system.

Citizen-patient at the center

Person-centered care places patients and their families as equal partners in shaping their care to promote autonomy, choice, and collaboration.

Precision medicine, IoT, and remote monitoring are accelerating this transformation. These technologies enable continuous data collection, real-time insights, and proactive interventions, empowering clinicians to deliver personalized, preventive, and efficient care.

They also enhance transparency and patient engagement, allowing individuals to take a more active role in managing their health, improving risk prediction, optimizing resource allocation, and fostering a patient-centered, preventive approach.

Improved care outcomes in a community, in turn, reduce healthcare costs.

Digital transformation

Digital technologies enable healthcare system modernization, thereby enhancing care delivery, compliance management, and improved patient outcomes.

An end-to-end transformation of healthcare enables seamless integration of advanced technologies. This increases availability of data across the healthcare value chain.

Adoption of advanced analytics and AI will uncover insights to improve patient care and enhance operational efficiency. This helps Payers streamline coding, improve claims accuracy, and accelerate reimbursements.

The evolution of agentic AI will transform clinical decision support, chronic disease management, surgical assistance, virtual health agents, and administrative workflow.

Value-based accountable care

An accountable care approach shifts from value-based payment to shared responsibility for delivering better outcomes, improving patient experiences, and managing costs.

This approach incentivizes proactive, coordinated, and preventive interventions, reducing resource utilization. Achieving this requires deep integration across clinical, operational, and financial systems.

Data interoperability, real-time analytics, and robust digital infrastructure are prerequisites for this model. Integrated platforms that unify clinical, operational, and financial data are critical.

Success of accountable care requires a full-system redesign powered by technology, data, and patient centricity.

Virtual and hybrid care solutions

The rise of virtual care is redefining healthcare delivery, with growing demand for digital engagement and personalized care anytime, anywhere.

As populations evolve into digital health consumers, their expectations shift toward accessible, real-time, and personalized healthcare solutions that extend beyond traditional hospital and care settings.

Health data generated by wearable technology, smartphones, and apps combined with clinical information, allow monitoring of chronic conditions at home and detect issues early.

For this model, healthcare systems must enable multidisciplinary care team coordination by allowing access to a shared, longitudinal view of the patient.

Key challenges and opportunities

The healthcare industry faces significant challenges.

Rising costs, inequitable outcomes and access

Global medical costs are surging (10.4% increase in 2024), driven by strained systems and rising demand.[1] Despite $1.8 trillion spent annually on global health initiatives, inefficiencies persist, leaving 4.5 billion people without essential care.[2]

Income, education, and employment directly impact health outcomes. While rural versus urban divide affects access to facilities and specialists.

AI, telemedicine, wearable devices, and integrated digital platforms are revolutionizing patient care worldwide.

Data from AI-driven diagnostics has the potential to reduce treatment costs by up to 50% and improve health outcomes by 40%[3]

Resource constraints

Resource constraints can lead to increased costs for healthcare providers and patients. Organizations need to prioritize certain services to control costs.

Rising healthcare costs are creating an unsustainable strain on systems, governments, and individuals.

Streamlining workflows, using technology, and adopting innovative care models, can help to improve resource utilization.

The World Health Organization projects an 11M healthcare worker shortage by 2030, especially in low- and middle-income countries; burnout, staffing shortages, and insufficient education investment worsen the issue[4]

Low interoperability maturity

Interoperability of data allows access to patient information from various sources. This helps improve patient outcomes.

Interoperability in healthcare lags other industries due to complex data, strict regulations, and diverse stakeholders.

The healthcare industry generates nearly one-third of all data globally and 97% of hospital data goes unused,[5] presenting a significant opportunity for data modernization. Unlocking data would advance interoperability in the healthcare ecosystem.

For the healthcare provider industry, 39% of respondents say concerns about privacy/confidentiality of data and information are the biggest challenges that come with new technologies such as generative AI, and these might impact its adoption[6]

Regulations, geo-politics, and data risks

Complex and evolving regulations in healthcare can stifle innovation and hinder development of life-saving treatments.

Geopolitical tensions complicate global health initiatives, slowing international cooperation and delaying progress in addressing global health threats.

The World Economic Forum's Global Risks Report highlights significant data-related risks in healthcare (such as data breaches, cyberattacks, challenges with AI/data usage) that could impact patient care and trust.[7]

In 2023, more than 93M healthcare records were exposed or stolen in data breaches at business associates compared to 34.9M records at healthcare providers[8]

Key technologies and their impact

Modern technologies enable a new era of healthcare differentiation.

Hybrid cloud by design

“Hybrid cloud by design” is more than just a cloud strategy; it is a comprehensive method for businesses to operate more efficiently and effectively.

By adopting this intentional approach, organizations can overcome the complexities of a disconnected IT estate, achieve higher ROI, and drive business outcomes through integrated, automated, and scalable solutions.

3x higher ROI

from IT programs over five years when organizations adopt hybrid-by-design principles[9]

Secure by design

"Secure by design” prioritizes the security of customers as a core business requirement, rather than merely treating it as a technical feature.

Key principles include implementing strong access controls, encryption, and regular vulnerability assessments, helping ensure that security is built into every layer of a system.

Healthcare organizations can minimize risks and protect data and systems from the ground up.

#1

At $7.42M, healthcare recorded the highest average breach cost among industries for the 14th consecutive year[10]

Data, automation, & AI

Data, automation, and AI are key to driving efficiency, insights, and innovation.

Using data to inform decisions, leveraging automation to streamline processes and reduce human error, and applying AI to enhance prediction, personalization, and decision-making empower healthcare organizations to optimize operations, improve patient experiences, and drive innovation.

Using data, automation, and AI, healthcare organizations can operate more intelligently, effectively, and at scale.

56%

of healthcare CEOs say the potential productivity gains from automation are so great they must accept significant risk to stay competitive[11]

Quantum

Quantum computing is an emergent field of cutting-edge computer science harnessing the unique qualities of quantum mechanics to solve problems beyond the ability of even the most powerful classical computers.

Healthcare organizations can harness the potential of quantum computing targeting real-world use cases in healthcare research, diagnostic assistance, precision medicine, and pricing.

By investing in quantum research and infrastructure today, healthcare systems can position themselves at the forefront of next-generation innovation.

41%

of healthcare CEOs view quantum computing as an opportunity for their company[12]

Select industry key performance indicators

Drive insights and decisions with industry benchmarks.[13]

Growth and innovation metrics

These metrics help healthcare providers assess their growth trajectory and make strategic decisions.

For example, in the digital age, scaling accurate conversational and ambient AI supporting patient care is an important growth signal.

Benchmark (80th percentile):

80%

Conversational AI intent recognition accuracy

Risk and compliance metrics

These metrics help ensure healthcare providers adhere to regulations, manage risks, and operate effectively.

For example, underspending on managing risks may threaten with financial losses, reputational damage, regulatory penalties, and potential for loss of life.

Median (50th percentile):

1.9%

Annual cost of enterprise risk function as a percentage of revenue

Cost and efficiency metrics

These metrics reflect healthcare providers' ability to control expenses, allocate resources, and generate profits while delivering care and achieving desired health outcomes.

For example, healthcare providers' need to understand sales, general, and administration cost relative to revenue.

Benchmark (80th percentile):

10%

Sales, general, and administration costs (SG&A) as a percentage of revenue

Strategic imperatives

- Business model innovation
- Product and service innovation
- Efficient and productive operations
- Strategic flexibility
- Governance

Key opportunities are emerging for business model innovation.

Value-based imperative

Value-based healthcare focuses on health outcomes and promotes evidence-based practices.

Key features:

- Predictive analytic models that capture, aggregate, and analyze data are required for implementation of this model.
- Success will depend on robust digital infrastructure, cross-sector collaboration, and a relentless focus on patient-centered, measurable outcomes.
- Challenges to implementation include: interoperability, skills, regulations, and technology.

Proactive care and wellness

Shifting toward creating healthier neighborhoods and communities can enhance overall well-being while reducing healthcare costs.

It requires moves from:

- Hospital to community, by providing better care close to people's homes.
- Treatment to prevention, promoting health literacy, supporting early intervention, and reducing health deterioration or avoidable exacerbations of ill health.
- Analogue to digital, with use of digital infrastructure and solutions to improve care.

Global healthcare partnerships

Healthcare partnerships have great potential to tackle complex challenges while driving innovation and sustainable impact.

For example:

- "Partnership for Health System Sustainability and Resilience," "Alliance for Health Policy and Systems Research," and the "European Observatory on Health Systems and Policies" are producing evidence and policy recommendations.[14]
- CVS Health, Stanford Medicine, and the American Heart Association are some of the founding members of the Coalition for Health AI (CHAI), working together to ensure AI adds value.[15]
- AstraZeneca, in collaboration with the World Economic Forum, fosters healthcare innovation through the A.Catalyst Network (A.CN) Africa Hub.[16]

41%
of healthcare provider executives say business model innovation is their
#1
organizational challenge[17]

Healthcare CEOs face the challenge of familiarity and capabilities in ecosystem partnerships.

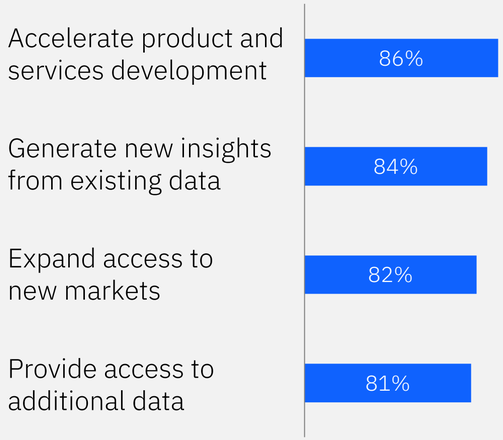
79% say they have the right network of partners to execute their strategy

56% expect critical expertise to become concentrated in a small cluster of organizations

and **50%** see changing strategic priorities requiring a reconfiguration of core business partnerships[18]

What to know
Business model innovation

Over the next three years, executives expect that AI and generative AI will support business model innovation in myriad ways:[19]



Business innovation must strike a balance across growth, efficiency, and risk.

Aggressively pursue digital transformation to enable the effective exchange of health information, linkage, and enrichment of data.

Technology, including AI, agentic AI (digital labor), and machine learning can:

- Drive advancements across diagnosis, treatment, and patient care.
- Improve operational efficiency across areas including clinical documentation, medical coding, billing, diagnostics support, and administrative workflow.
- Enable data interoperability to access patient information from various sources and improve patient outcomes.

Move from fee-for-service to value-based and accountable care. This evolution reflects a deeper commitment to achieving better health outcomes, improving patient experiences, and ensuring cost-efficiency.

Accountable care models hold providers jointly responsible for the health and financial outcomes of defined patient populations. This transition moves healthcare from:

- Volume to value: Shifting incentives from the number of services provided to the quality, effectiveness, and equity of care.
- Transactional care to coordinated accountability: Emphasizing provider collaboration, shared savings, and risk-sharing arrangements based on outcomes and patient experience.
- Symptom treatment to whole-person care: Addressing medical needs alongside behavioral, social, and environmental factors that impact health.

Integrate within the global healthcare ecosystem to help tackle the next public health crisis by:

- Combatting health inequities for underserved populations.
- Enabling the interoperability of patient data from various sources.
- Enhancing data sharing and facilitating collaboration, ultimately leading to a more efficient healthcare system and better patient outcomes.

The COVID-19 pandemic highlighted the need for healthcare organizations to collaborate across the ecosystem and across geographic borders.

Healthcare organizations must leverage open standards to enable this collaboration, drive innovation, and prevent vendor lock-in.

What to know
Product and service innovation

Technology-fueled products and services support both patients and healthcare professionals.

Hyper-personalization at scale

Personalized healthcare is a proactive framework to create tailored health plans. It uses predictive technologies to assess individual health risks and encourages patient engagement, aiming for the best health outcomes.

- Cigna Healthcare is connecting care touchpoints to create comprehensive and personalized healthcare experiences that improve health outcomes, reduce overall costs, and make the patient journey less arduous.[20]
- The Roche Digital Pathology Open Environment brings together a wide array of innovative AI-based pathology tools to help clinicians improve patient care and expand personalized healthcare.[21]

Empowering healthcare professionals

The COVID-19 pandemic worsened global healthcare challenges, including workforce shortages, widening disparities, and financial strain.

- In the US, 81% of doctors report being overworked, while 86% worry about the system's ability to support an aging population.[22]
- 71% of UK NHS staff say they lack sufficient time for patient care.[23]
- Technologies such as digital health tools and virtual care are transforming healthcare by empowering professionals with real-time insights, seamless data integration, and reduced administrative burdens. These innovations streamline workflows and enhance decision-making.

Going beyond the patient experience

With limited providers and rising patient expectations, health systems struggle to meet demand.

- 92% of healthcare leaders view automation as key to addressing staff shortages.[24]
- AI, digital tools, and virtual care enhance workflows, improve decision-making, and expand remote care, enabling clinicians to prioritize patient-centered care.
- Generative AI further bridges gaps by engaging patients throughout their health journeys.

The
#1
priority for Healthcare Provider CEOs is product and service innovation[25]

Yet just
36%
of Healthcare Provider tech leaders say they are effective at delivering product and service innovation[26]

What to do
Product and service innovation

33%

of healthcare organizations say they are using generative AI for digital product idea generation[27]

Healthcare providers are increasingly deploying generative AI for product development[28]

April 2023	June 2023
Where is your organization considering deploying generative AI?	To what degree is your organization deploying generative AI in this function?
Product development	Product development
29%	33% ↑

Innovate key products and services with AI.

Telemedicine, remote monitoring, and AI-driven insights enable proactive, patient-centered care. By breaking down geographic barriers and enhancing real-time decision-making, these advancements will make high-quality healthcare more accessible, equitable, and efficient.

Embrace hyper-personalization in healthcare

In healthcare, hyper-personalization offers the opportunity to radically improve how patients, clinicians, and care teams engage with digital health tools — making interactions more intuitive, supportive, and effective — driving better engagement, adherence, and outcomes.

Generative AI can create adaptive, context-aware user experiences that respond to individual behaviors, clinical profiles, and preferences. For example:

- Patients receive personalized health education, proactive symptom guidance, or nudges tailored to their care plan and current condition.
- AI-driven decision support tools can surface the most relevant data to clinicians or next-best actions based on patient risk, acuity, or treatment history.
- Care teams can benefit in care coordination and continuity by prioritizing tasks, alerts, or follow-ups dynamically based on patient needs and clinical urgency.

Tap into customer data to create hyper-personalized experiences

- Orchestrate disparate data, including from IoT devices, to enrich the patient experience. Use generative AI to map your product priorities to the patient's data-driven pain points.
- Keep your product roadmap relevant and targeted by using generative AI to continually refine a backlog that will deliver the most business value.

Adopt platform-based healthcare models

- Combine services and technology to establish a strong connection between healthcare. providers and patients to optimize the patient experience and streamline the treatment and care journey.
- Champion patient centricity through enhanced digital-engagement channels.

For the patient, innovation equates to improved health outcomes and better quality of life.

It is therefore essential that healthcare organizations prioritize product and service innovation to drive new therapies and treatments that meet ever evolving patient needs and capture new markets.

What to know
Efficient and productive operations

Automation and advanced analytics drive operational efficiencies.

Automation in healthcare operations

Five out of 10 executives say automation boosts workforce productivity and agility—and generative AI amplifies these benefits.[29] Process mining can uncover choke points, and generative AI can enhance human ingenuity. These tools free up people to focus on high-value tasks that require empathy and creativity.

- Cleveland Clinic and other healthcare systems are adopting robotic process automation (RPA) to streamline clerical tasks and speed up work in electronic health record (EHR) and ancillary systems.[30]
- Healthcare executives are optimistic about what generative AI can do. They expect a 41% increase in productivity by applying generative AI to business processes.[31]
- Providence implemented AI solutions, reducing administrative messages by 28% and total messages by 8%.[32]

Supply chain optimization

In healthcare, fragmented teams and poor data visibility lead to rising supply costs and delays. Replacing traditional dashboards with real-time large language model (LLM) queries enhances decision-making.

- By using LLMs for immediate insights, organizations help eliminate latency, enabling faster, data-driven decisions.
- AdventHealth is enhancing supply chain efficiency with an intelligent Inventory Control Tower, ensuring critical medical supplies are always available. This strengthens forecasting and modeling, guaranteeing the right products in the right volumes for healthcare teams and patients.[33]
- Real-time inventory tracking and better supplier collaboration improve hospital efficiency and patient satisfaction. Blockchain helps address product safety, as well as regulatory and fraud challenges in the global supply chain.

69%

of healthcare CEOs say the potential productivity gains from automation are so great they must accept significant risk to stay competitive[34]

55%

of healthcare provider CEOs say automation is one technology that will most help to deliver the results needed over the next two years[35]

What to do
Efficient and productive operations

16%

of healthcare executives say generative AI will be critically important to their supply chain automation futures[36]

45%

of IT executives are already using generative AI to predict outcomes, efficiency gains, and ROI in IT and network automation initiatives,[37] and

65%

of IT executives will do the same by 2026[38]

Improve cost efficiency and streamline key operations.

Healthcare organizations can use generative AI to modernize supply chain applications and improve efficiency, streamlining operations and enhancing responsiveness to patient demand. 92% of healthcare supply chain executives agree that generative AI fundamentally transforms their employee roles,[39] and 75% expect it to improve management by analyzing key supplier performance metrics.[40] At the same time, automation helps accelerate decision-making, minimize waste, and improve sustainability.

Apply predictive analytics to increase productivity

– Use generative AI to detect patterns and trends that highlight opportunities to streamline workflows across hospitals and drive greater productivity across patient-facing and back-office staff. Respond quickly to the insights uncovered by adopting flexible operating models.

Optimize processes by streamlining clinical and administrative tasks, reducing waste, and automating repetitive activities

– Identify processes that create the greatest frustration for operations teams and find ways to automate them. By optimizing processes, healthcare organizations can improve quality of care, reduce costs, and enhance the overall patient experience.

Outsource to scale expertise

– Partner with BPO providers to outsource non-clinical operations and augment internal capabilities by expanding automation and workflow optimization and quickly deploying the most advanced AI and automation technologies.

The availability of real-time, integrated, and trusted data from across the supply chain will help healthcare professionals to respond more quickly to patient's needs.

It enables hospitals to predict threats coming around the corner and respond to potential supply chain bottlenecks such as the availability of beds or patient medication.

Resilient, distributed IT environments boost flexibility in healthcare.

By managing data and applications for resilience across distributed IT environments, healthcare organizations gain flexibility to maintain continuous operations, scale resources, enhance security, and deliver better patient care.

Cloud-based electronic health record (EHR) systems offer flexibility, security, and enhanced functionality to empower healthcare providers to deliver better, more coordinated care. However strict access controls and compliance are needed to mitigate data privacy concerns.

- Clinicians can access patient records anytime, anywhere, improving care coordination.
- Cloud infrastructure scales easily as the hospital grows.
- Leading cloud providers enable compliance with regulations such as HIPAA, GDPR, and so on, as they offer security features such as encryption, multifactor authentication and more to protect patient data.

Healthcare providers that leverage data effectively can differentiate themselves by offering higher quality care, better outcomes, and more efficient service.

- Data empowers hospitals to be proactive, precise, and patient-centered.
- Analytics help identify the most effective treatment protocols by analyzing outcomes data and flagging high-risk patients early.
- Data on workflows, resource utilization, and patient flow helps hospitals reduce wait times, optimize staff allocation, and cut costs.

Shared services help healthcare organizations centralize support functions and enhance operational effectiveness.

- Common shared services in healthcare include patient administrative services, clinical support services, supply chain management, and IT services such as EHR management, cybersecurity, and data and analytics platforms.
- Benefits of shared services include cost reduction, standardized processes and policies, improved quality and compliance, optimized workflows, and better resource utilization.
- Challenges include buy-in across departments and facilities, data privacy and security, governance, and specific customization requirements of different business units.

58%

of Healthcare Providers say “Optimized enterprise-wide spending on public cloud services” is one of the biggest benefits their organization achieved from migrating applications to cloud[41]

Only

11%

of Healthcare Providers strongly agree that their IT/Cloud transformation or modernization programs are secure by design[42]

What to do
Strategic flexibility

71%

of Healthcare CEOs say proprietary data is key to unlocking the value of generative AI[43]

And **68%**

of Healthcare CEOs say an integrated enterprise-data architecture is critical to enable cross-functional collaboration and drive innovation[44]

But **50%**

of Healthcare CEOs say their organization has disconnected technology due to the pace of recent investments[45]

Flexibility enables innovation and scalability.

To gain the strategic flexibility to innovate, scale, and deliver patient-centered care effectively, healthcare organizations should consider modernizing technology, optimizing processes, empowering staff, and embracing data-driven decision-making.

Move applications and data to cloud platforms for scalable, on-demand resources

- Identify which workloads are suitable for cloud migration (such as EHR systems, analytics, telehealth platforms).
- Choose cloud providers with strong healthcare compliance certifications (HIPAA, HITRUST, GDPR).
- Use cloud-enabled capabilities such as AI, big data analytics, and telehealth to enhance services.

Establish an inter-/intra-operable, integrated, democratized and trusted view of healthcare data across the healthcare continuum

- Integrate clinical and non-clinical patient data from across vendor systems.
- Exchange protected health information in compliance with all applicable laws and within a trusted network.
- Deliver personalized care through a holistic view of the patient and caregiver.

Centralize shared services

- Consolidate administrative and support functions (billing, HR, IT) to reduce duplication and streamline operations.
- Invest in IT platforms and tools that enable shared access, data integration, and collaboration.
- Implement change management, addressing resistance by highlighting benefits and involving staff in improvements.

Managing data and applications for resilience across distributed IT environments is crucial for healthcare organizations and provides significant flexibility in multiple ways.

This helps ensure healthcare providers have constant access to EHRs, diagnostic tools, and communication systems—critical for patient care.

Secure and private health data is a mandate for trust and compliance.

To help ensure secure, ethical, and efficient health data-sharing, effective governance and robust data rights are essential. Their practical implementation across organizational structures and processes will enable stakeholders to significantly improve health data management.

Regulatory compliance and ethics are becoming increasingly important as 89% of healthcare CEOs stress the need for transparency around the adoption of new technologies to build trust.[46]

- AdventHealth is using AI in over 40 applications, each approved by an advisory board that prioritizes patient safety and privacy. The board, made up of healthcare professionals and industry experts, ensures each program is thoroughly vetted before being used with patients.[47]

With the rise of generative AI, trust, security, and regulatory concerns remain critical for biopharmaceutical companies, health systems, and medical device manufacturers. Despite this, only 44% of healthcare technology leaders report their organizations are implementing key responsible AI practices such as transparency, fairness, and privacy.[48]

- Using generative AI necessitates strong AI governance, with 42% of healthcare provider organizations acknowledging that AI has significantly altered governance processes.[49] Additionally, 69% agree that generative AI has reshaped AI ethics governance.[50]
- To ensure safety and compliance, 64% of healthcare technology leaders confirm they have governance structures in place to guarantee their AI workflows are transparent, explainable, and compliant.[51]
- Furthermore, 79% of healthcare provider organizations say they have a dedicated risk function for AI, with 77% conducting regular risk assessments to identify security threats.[52]

49%

of healthcare provider organizations say inefficient processes/governance is one of their greatest barriers to innovation[53]

What to do
Governance

53%

of healthcare provider organizations agree that their risk management practices are integrated into the organization's overall business processes and decision-making[54]

Mitigate risks across the healthcare ecosystem.

Establishing policies and procedures will help healthcare organizations mitigate regulatory risks. Educating and training the healthcare workforce on the everchanging regulatory landscape and new types of risks—particularly for AI—is crucial for organizations to manage regulatory and compliance issues.

Preempt risk with predictive AI healthcare assistants

– Healthcare organizations can introduce predictive analytics-based AI assistants to rapidly identify unlikely but severe risks, helping risk managers quickly and efficiently take proactive measures to respond to a wider variety of threats.

Leverage AI and digital health technologies to address regulatory challenges in healthcare

– These technologies help streamline processes, manage compliance, and enhance patient care. This includes using AI for data analysis, automating tasks, and improving the efficiency of regulatory processes. Digital tools can facilitate remote monitoring, telehealth, and secure data management addressing various regulatory concerns.

Invest in cybersecurity and data protection technologies

– Apply robust solutions to help protect patient data inside and outside of healthcare establishments as well as manage data breaches and other regulatory risks.

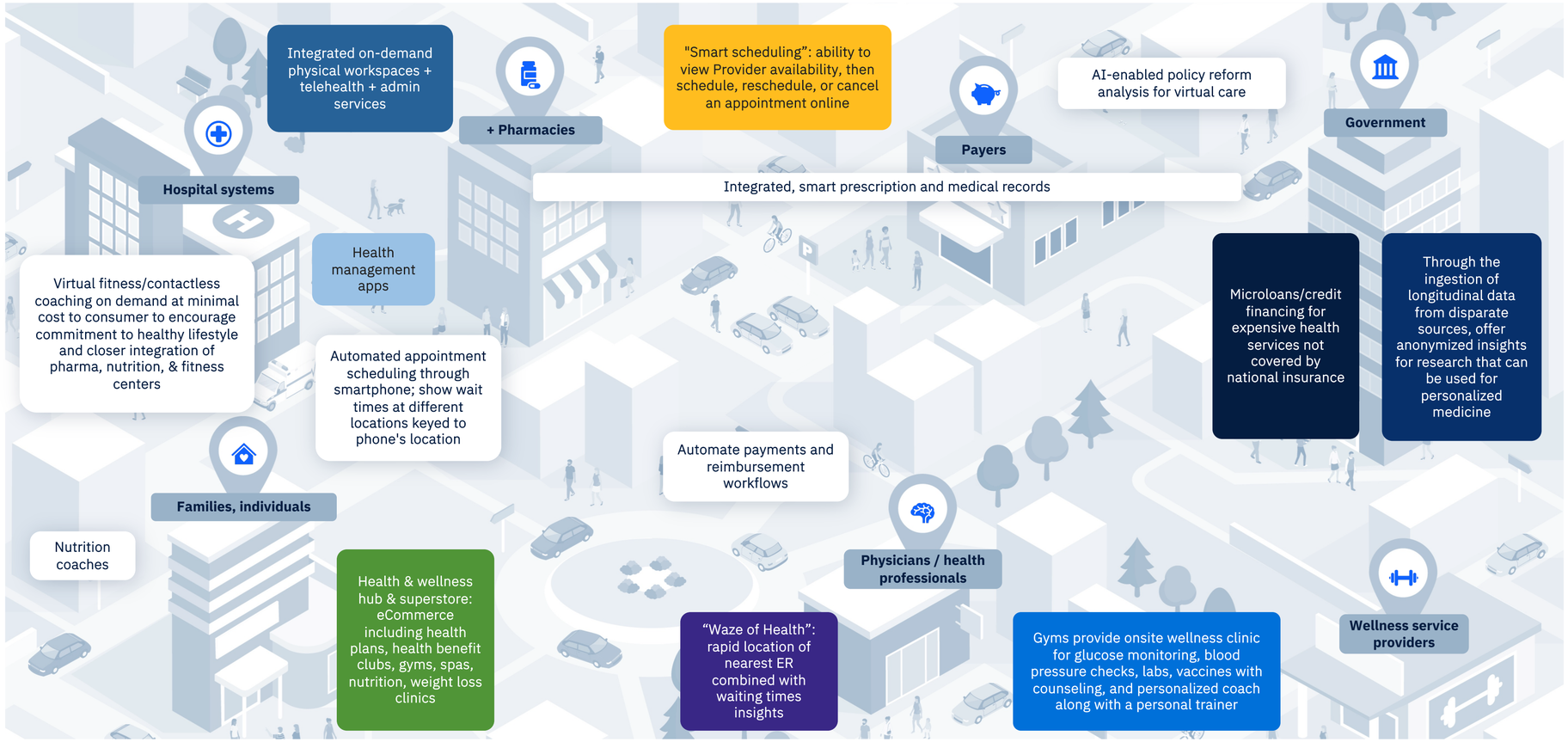
Healthcare lags other industries in adopting technology due to regulatory complexity and concerns about patient safety and data security.

Good healthcare governance must be borderless, ensuring the safety, quality of care, and regulatory compliance of both hospitalized patients and those using connected medical devices in the home.

Transformational technologies

- Data
- Automation
- AI, generative AI, and agentic AI
- Hybrid cloud by design
- Secure by design
- Quantum computing

New technologies will transform the health and wellness ecosystem



Source: IBM Consulting Healthcare & Life Sciences

Technologies
Data

51%
of Healthcare Provider CEOs say inadequate technology/data is the greatest barrier to innovation[55]

40%
of Healthcare Provider CFOs say they have implemented employee training on how to understand and use data[56]

and only **30%**
of Healthcare Provider CFOs say they have implemented a center of excellence for data science[57]

Effective data management is a precondition to scale AI enterprise-wide.

What to know

A typical hospital produces 50 petabytes of data per year, yet 97% of all global data produced by hospitals each year goes unused.[58]

Fueled by advancements in big data, AI, and generative AI, health data now constitutes approximately 30% of the world's total data volume.[59] This healthcare data, including information from clinical trials, disease registries, EHRs, and medical devices, is growing at a CAGR of 36%.[60] Despite this exponential growth, application of health data to healthcare solutions remains a challenge. 77% of health systems lack a coherent integrated analytics strategy.[61] Even if data volume and privacy challenges are resolved, interoperability remains a critical hurdle.

Wearable technologies, smartphones, and apps generate health data that enhances clinical insights. By enabling at-home monitoring of chronic conditions, this data provides early warnings that can help prevent complications and improve outcomes. Integrating this data into healthcare systems demands careful attention to consent, security, transparency, and accountability.

What to do

The immense potential of health data offers a remarkable opportunity to enhance both patient outcomes and systemic efficiency.

- Deploy generative AI solutions to extract clinical meaning from unstructured data sources (such as physician notes, discharge summaries, imaging reports) and surface real-time insights for diagnosis support, care coordination, and patient outreach.
- Mandate the use of standardized clinical vocabularies and data formats (such as HL7 FHIR, SNOMED CT, LOINC) across systems and institutions to help ensure data integrity, canonical data models, semantic interoperability, and seamless exchange across providers, payers, and researchers.
- Establish trusted data-sharing frameworks that allow healthcare stakeholders to securely exchange permissioned data, helping manage both privacy compliance and longitudinal patient visibility.
- Build integrated health data environments that combine EHR, claims, genomics, remote monitoring, and patient-reported outcomes into unified views—enabling use in population health management, clinical trials, and real-world evidence generation.

Scaling generative AI is a key step on the path to intelligent automation.

88%

of Healthcare Executives expect to digitize their organization's workflows and leverage AI-powered automation by 2026[62]

55%

of Healthcare Executives say they are looking most at automation (including RPA) to help deliver the results needed over the next two years[63]

What to know

In the next two years, for the healthcare provider industry, more than 8 in 10 IT and operational executives say automation will be essential to implement generative AI capabilities.[64]

89% of executives report that key investments in automation will include generative AI capabilities.[65]

- For example, Stanford Health Care is using generative AI to reduce clinician burnout and improve patient care.[66] The AI tool automatically drafts clinical summaries from exam room or telehealth conversations, allowing physicians to focus more on patients and cut their documentation time.

AI has already demonstrated the potential to revolutionize healthcare without disrupting patient care when applied to back-office operations and non-frontline clinical decisions.

- For example, the UK National Health Service has used AI-driven automation to reduce processing time of discharge letters from 10 minutes to only four seconds per patient.[67]

What to do

Intelligent automation—blending AI, digital tools, and robotics—is streamlining administrative tasks in healthcare while increasing patient access to services. Initial use cases focus on activities that are time-intensive and repetitive but essential, such as sending appointment reminders.

Unlocking automation's full potential demands collaboration across providers, government agencies, and technology firms to enhance patient outcomes and medical staff experiences.

The path to intelligent automation includes:

- Initial testing within safe and secure research environments to demonstrate accuracy and equality of the tools.
- Focusing on core, repetitive operational use cases for automation such as scheduling appointments, processing electronic health records, and sending appointment reminders.
- Establishing governance on generative AI use and adoption to manage risks and seize opportunities.

Technologies
AI

The healthcare sector is undergoing a major transformation, with the AI market expected to grow at a CAGR of

44% from 2025-2032, reaching a total value of

$504B

by the end of this period[68]

AI-driven diagnostics have the potential to reduce treatment costs by up to

50%

and improve health outcomes by

40%[69]

Artificial intelligence is the foundation for transformation.

What to know

Healthcare organizations are incorporating AI use cases in unique ways:

- Disease diagnosis. AI algorithms can analyze medical images (such as X-rays, MRIs, CT scans) more accurately, helping in early detection of diseases.
- Personalized treatment. AI can analyze a patient's genetic makeup and medical history to suggest a personalized treatment plan that improves treatment outcomes.
- Virtual health assistants: AI-powered chatbots and virtual assistants can provide patients with medical advice, remind them to take medication, monitor their symptoms, and offer emotional support.
- Predictive analytics: AI can predict disease outbreaks by analyzing patterns in data from various sources such as weather, travel, and population density. This can aid in preventive measures and resource allocation.
- Wearable health monitoring. AI can analyze real-time data from wearable devices to monitor patients' health, detect anomalies, and alert healthcare providers about potential issues.

What to do

Healthcare organizations can adopt AI by implementing it in various ways to improve patient care, streamline operations, and enhance research.

- Healthcare organizations should focus beyond clinical AI. Patient-facing tools may reshape the industry, but immediate gains lie in deploying the technology in back- and middle-office operations. For example, AI can improve patient flow and help reduce missed appointments, unnecessary follow-ups, and delayed discharges.
- Start with small, focused AI projects that deliver tangible value, rather than attempting to solve complex problems all at once.
- Prioritize transparency, ethics, and patient data security as you integrate AI into healthcare.
- Train staff in responsible AI use to help ensure it enhances rather than replaces human expertise. For example, human reviewers continue to oversee the process, helping to ensure accuracy and patient safety.
- Seek out collaborators who understand AI and share a vision for becoming AI-centric.

Generative AI can revolutionize several areas of the healthcare ecosystem and help address resource constraints.

60%

of healthcare CEOs say competitive advantage depends on who has the most advanced generative AI[70]

51%

of healthcare respondents say that benefits from generative AI adoption are already being realized across their organization[71]

What to know

73% of technology leaders expect generative AI solutions to automatically resolve IT issues with little to no human intervention.[72]

Some of the generative AI applications used by healthcare organizations include:

- GE Healthcare leverages advanced machine learning and generative AI to develop clinical foundation models, enhancing innovative application development and workflow optimization for elevated patient care. These applications aim to reduce physician burden and promote personalized care.[73]
- Kaiser Permanente uses a generative AI-powered tool for securely summarizing medical data from unscripted conversations, improving clinical documentation.[74]
- Northwestern Medicine harnesses generative AI to revolutionize diagnostics and administration, augmenting patient experiences and enabling healthcare professionals to concentrate more on patient care.[75]
- The UK National Health Service has used generative AI to automate clinical coding, and it processes 500,000 patient episodes in 24 hours.[76]

What to do

Organizations should redefine their operational methodologies by fostering an environment that encourages experimentation with generative AI, particularly harnessing its potential to deliver highly personalized experiences.

- In the short-term, focus on employing generative AI for immediate impact, working to reduce the burden of slow, inefficient, or unnecessary tasks in back- and middle office operations. Leave the patient-facing tools to later.
- Train staff on responsible AI practice to maintain transparency and ethical standards as well as to protect patient data.
- Empower healthcare professionals to curate and maintain reliable data repositories for model training to enhance the quality of AI-driven interactions and instill confidence in the accuracy and reliability of the information provided.
- Have AI systems collaborate with healthcare workers to enhance decision-making and upskill employees.

Agentic AI can help the healthcare ecosystem address resource constraints and efficiency.

65%

of healthcare CEOs say their organization is actively adopting AI agents and is prepared to implement them at scale[77]

62%

of healthcare executives say they have prepared their employees for the cultural and operational shifts from AI agents[78]

What to know

Adoption of agentic AI technologies can help the healthcare ecosystem address resource constraints and gain efficiencies in areas such as diagnostics, patient care, and administrative tasks.

Agentic AI can:

- Automate repetitive, low-value tasks and handle rising workloads due to staff shortage.
  Innovaccer introduced a suite of AI agents for providers to automate scheduling, patient intake, and referrals.[79]
- Act as a virtual health assistant with real-time monitoring and medication and appointment reminders.
  Propeller Health leverages agentic AI in its smart inhaler, collecting real-time data on medication use and environmental factors. The device tracks patient patterns and alerts providers when needed, enhancing respiratory care.[80]
- Identify qualifying patients for clinical trials and monitor participants for positive or adverse effects.
  Inato's new AI agent enables research sites to de-identify patient records, quickly determine which trials are relevant to each patient, and evaluate patients against inclusion and exclusion criteria to assess eligibility—accurately, at scale, and in compliance with HIPAA guidelines.[81]

What to do

Healthcare organizations should clearly outline how AI assistants and AI agents should operate and who is responsible for validating their work.

- Create a data fabric that makes it possible to integrate AI agents and assistants into daily operations, automating routine tasks (such as bed utilization, appointment reminders) and end-to-end workflows.
- Establish a feedback loop that allows AI assistants and agents to provide feedback and suggestions to improve data quality and accessibility, as well as business processes.
- Assign healthcare professionals to be responsible for actions taken by AI agents, helping ensure protection of patient data and privacy is at the core. Establish audit trails to help ensure alignment with organizational policies, legal, and compliance.

Technologies
Hybrid cloud by design

27%

of healthcare executives say the way they design, deliver, and manage cloud architecture will require significant to radical changes by 2026[82]

An intentional approach to architecture is key to modernization.

What to know

Healthcare providers and payers around the world are moving to the cloud, with many turning to hybrid cloud and multicloud environments as they make the shift.

- Only 19% of executives say they're very confident that their cloud and data capabilities are fully ready to support generative AI investments in 2024, while 24% said they're unsure of readiness.[83]
- Intentional investments in an organization's hybrid-by-design technology estate are essential to the success of its generative AI initiatives.
- Future investments will only be made for interventions delivering proven value, at speed and scale. The health system of the future will be "hybrid," rather than "digital," with seamless integration—an expectation for each system.
- For healthcare, hybrid cloud is being used across electronic health records management, medical image storage and analysis, telemedicine platforms, disaster recovery and business continuity, clinical research and data analytics, compliance and data residency management, application development and testing, IoT, and wearable data processing.

What to do

Hybrid by design is a tested, codified architectural framework that helps organizations optimize business value through technology, enabling the agility, speed, and integration needed to achieve future business outcomes.

To get started:

- Design your hybrid cloud architecture deliberately through the lens of business priorities.
- Help developers reduce time-to-value by leveraging generative AI to do the code translation for application modernization.
- Reshuffle your IT estate for fit-for-purpose use by putting dormant assets to better use.
- Automate the flow of patient data across facilities through standardized integration across healthcare providers.
- Ensure a complete view of the patient to enable personalized healthcare experiences.

Technologies
Secure by design

Healthcare remained the most expensive industry for breaches.

With an average breach cost of **$7.42 million**, the healthcare sector once again topped all industries for the 14th consecutive year — despite a notable decrease from $9.77 million in 2024[84]

35% of executives predict that organizations in the healthcare provider industry will experience a major data breach within **2 years** because of their use of generative AI[85]

Safeguarding healthcare's sensitive data is an added, critical responsibility.

What to know

Cyber attackers continue to value and target healthcare industry's patient personal identification information (PII), which can be used for identity theft, insurance fraud and other financial crimes. Healthcare breaches took the longest to identify and contain at 279 days. That's more than five weeks longer than the global average.[86]

Cybersecurity is one of the most vital features of any AI tool that is used in the healthcare space due to patient data and privacy concerns. Yet 22% of generative AI projects remain unsecured, with many organizations realizing security gaps only after experiencing breaches.[87] Concerns carry over into emerging agentic AI tools as well.

In response to these growing risks and a more complex threat landscape, security spending is on the rise.[88]

What to do

Aligning cybersecurity with business strategy is critical—an approach taken by 57% of healthcare provider organizations.89 And strengthening AI security is crucial.

- Enable collaboration between cybersecurity, technology, and operations leaders to assess adversarial AI and data exposure risks.
- Encrypt and monitor training data while continuously scanning for vulnerabilities such as data poisoning.
- Establish clear governance policies to manage transparency, compliance, and accountability in AI-driven healthcare applications.
- Educate teams on AI-specific threats and best practices for security and data hygiene.
- Leverage AI to automate security tasks and enhance human-technology collaboration to improve protection.
- Deploy advanced AI tools to detect threats faster and prevent disruptions.
- Collaborate with trusted partners to build a strong AI security framework. Notably, 41% of healthcare organizations prioritize cybersecurity and data privacy alignment with business partners.[90]

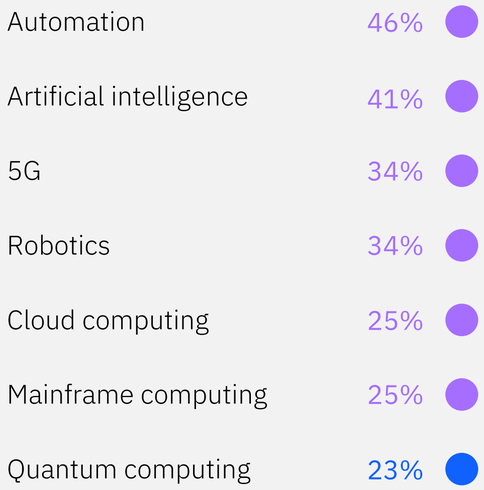
Technologies
Quantum computing

Quantum computing enables precise analysis of complex data, helping improve treatment planning.

26%

of healthcare provider executives agree that their quantum computing strategy is aligned with their business strategy[91]

Technologies where healthcare organizations will be investing in 2025:[92]



What to know

Healthcare data, including information from clinical trials, disease registries, EHRs, and medical devices, is growing at a CAGR of 36%.[93] This data plays a crucial role in addressing the quadruple aim of healthcare: improving health outcomes, reducing costs, enhancing patient experiences, and improving healthcare practitioners' work lives.

Quantum computing offers the computing power and speed needed to meet these demands. It requires a new mindset, skill sets, IT architectures, and strategies. Cleveland Clinic and IBM strive to advance discovery in healthcare and life sciences through high-performance computing using hybrid cloud, AI, and quantum computing technologies.[94]

Key quantum computing use cases in healthcare include diagnostic assistance, determining insurance premiums and pricing, and precision medicine. Quantum-enabled tools could represent and learn from biological data more efficiently, driving breakthroughs in biomedical research.

What to do

Develop a strategic and collaborative approach to quantum innovation:

- Define a quantum healthcare roadmap by identifying high-impact use cases that align with strategic priorities in care delivery and population health.
- Invest in quantum-literate talent pipelines and cross-training between quantum computing, AI, and biomedical data science.
- Forge cross-sector partnerships with academic institutions, quantum hardware/software providers, and healthcare innovators to co-develop solutions and accelerate translational research.
- Use quantum algorithms to quantify care impact by improving the accuracy of outcome predictions.
- Enhance medical imaging and genomics interpretation through quantum-enhanced machine learning, enabling earlier detection of diseases.
- Embed quantum-safe cybersecurity planning into the organization’s digital infrastructure roadmap to help ensure secure data exchange.

In closing

Traditionally, healthcare has lagged other industries in adopting technology due to regulatory complexity plus concerns about patient safety and data security.

Healthcare CEOs must move fast and focus on capturing quick wins in the back-office operations and non-frontline clinical decisions before focusing on patient-facing tools.

Start by embracing digital technologies and leverage virtual capacity, data analytics, and AI to improve healthcare access, quality, and affordability.

Focus on strategic actions in these areas to successfully transform healthcare business models and operations.

Move towards consumer-centric, preventive, and outcomes-based care

Reimagine healthcare by placing individuals—not just patients—at the center of a system designed to promote lifelong, whole-person health. Treat people as equal partners, empowering them to co-create their health journey through personalized, proactive, and participatory models of care.

Enable “overall health” by delivering a seamless continuum of care that:

- Integrates physical, mental, emotional, and behavioral health.
- Incorporates individual social and environmental determinants.
- Is proactively delivered—not just reactively administered.
- Is accessible anytime, anywhere through digital and hybrid care models.
- Is powered by real-time data, personalized interventions, and AI-enabled insights.

Empower healthcare professionals

Focus on removing friction to improve the service and outcomes for patients. Continuously evaluate the skill supply and demand for current and future requirements to ensure your organization stays up-to-date.

Manage risk and compliance

Stay current as regulatory bodies worldwide work on effective steps to mitigate risks associated with this transformation explosion and align with local/regional security and regulatory compliance.

Prioritize security and resiliency

With the healthcare industry having the highest cost of a data breach across all industries, it must focus on securing user, partner, and patient identities. Ensure technology is secure and scalable and establish a data access and security framework that protects data and restricts access to authorized personnel. Put in place effective incident response and recovery plans.

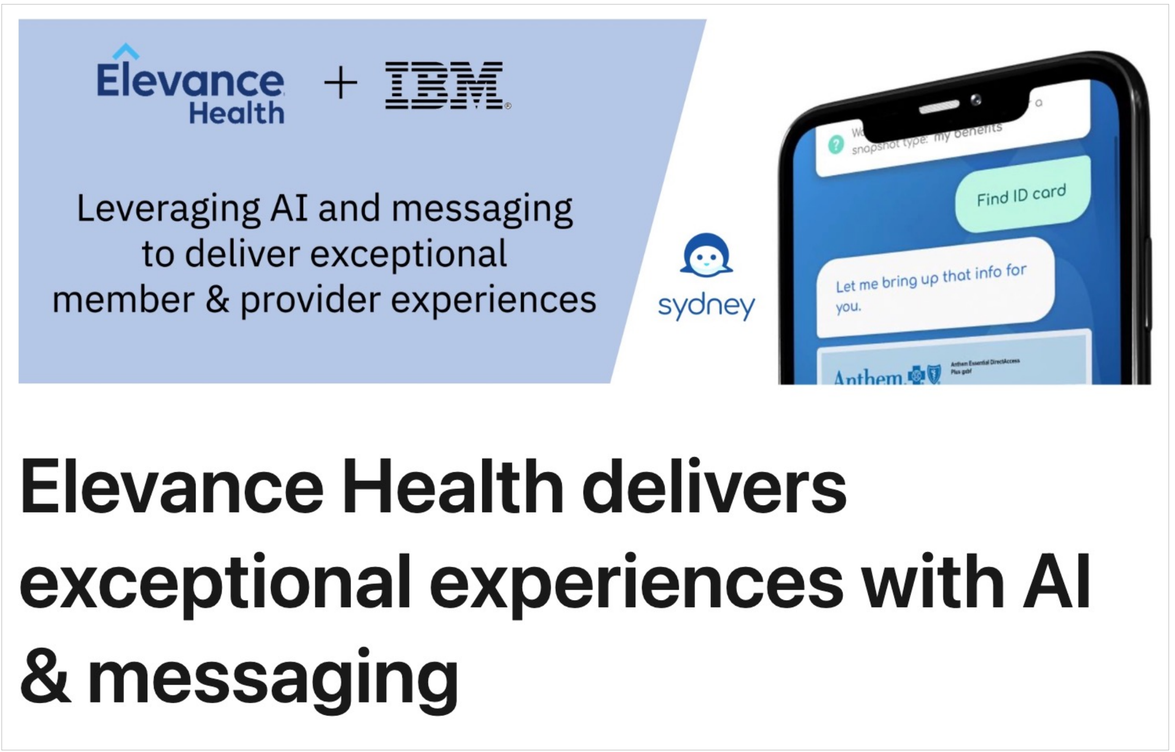
Optimize healthcare costs and dynamics

Implement more efficient processes and improved resource utilization by streamlining workflows with technology and adopting innovative care models. Explore the potential of data from AI-driven diagnostics to reduce treatment costs and improve health outcomes.

Healthcare

Case studies

Elevance Health delivers exceptional experiences with AI and messaging.



Challenge

Elevance Health, formerly Anthem, Inc., has been a disruptor in the healthcare industry, maniacally focused on elevating whole health and advancing beyond healthcare. They are on an incredible journey evolving from a health benefits organization to a lifetime, trusted health partner. Their new brand, Elevance Health, very aptly captures that transition. Elevance Health has been on a mission to deliver exceptional digital-first, AI-first experiences.

Solution

Starting from 46M phone calls/year in early 2020, Elevance Health has had huge success moving 24% of those interactions to digital in under two years. IBM and Elevance Health have committed to joint outcomes and are focused on improving CSAT (customer satisfaction) scores and effectiveness of AI interactions.

The solution combined the best-in-class capabilities from

- Elevance Health expertise in healthcare service experience, personalization, simplifying plan complexities, deep APIs, natural language search, and app design
- IBM Consulting® expertise in conversational AI, large enterprise AI deployments on hybrid clouds, experience design, healthcare-specific AI development toolkit, advanced orchestration, and conversational insights
- IBM Watson® Assistant for Conversational AI
- LivePerson conversational cloud for async messaging.

5M+
annual reduction in calls

4M chats
successfully addressed by AI

>5 pts
higher CSAT than any channel

Read the full story →

University Hospitals Coventry & Warwickshire NHS Trust delivers patient-centered care from AI-centered efficiencies.

University Hospitals Coventry and Warwickshire NHS Trust

Challenge

The National Health Service (NHS) in the UK is facing unprecedented demand. Despite its best efforts, NHS waiting lists for elective care are growing, leading providers to look for innovative ways to continue to serve UK citizens with the world-class healthcare they expect.

University Hospitals Coventry and Warwickshire (UHCW) NHS Trust has a particularly pioneering mindset and innovative approach to patient-centric care, having already built a tool that targets health inequalities in the communities it serves—the HEARTT tool. As part of its UHCW Improvement System (UHCWi) methodology, the Trust was keen to pilot AI and other analytics to identify areas that could benefit from the use of technology to improve productivity and deliver improved health outcomes to patients.

Solution

UHCW NHS Trust, IBM Consulting®, and Celonis SE formed a close-knit, blended team to analyze the Trust's outpatient services through the lens of patient experience and health outcomes. The approach combined the IBM Garage™ model, Celonis' AI-powered process mining, UHCW NHS Trust's leading data analytics practices and its ongoing operation improvement activities.

One improvement focused on UHCW NHS Trust's approach to missed patient appointments—known as "did not attends (DNAs)"—which are more common among those with high deprivation scores.

As part of the project, IBM and UHCW NHS Trust also piloted IBM watsonx.ai® technology to train, tune, and deploy machine learning models to support hospital staff in scheduling and validating patients on the elective backlog.

>700
more patients seen weekly without added staff

6%
drop in missed appointments for some patients

Read the full story →

National Healthcare Group, Singapore enhances HR processes.

Challenge

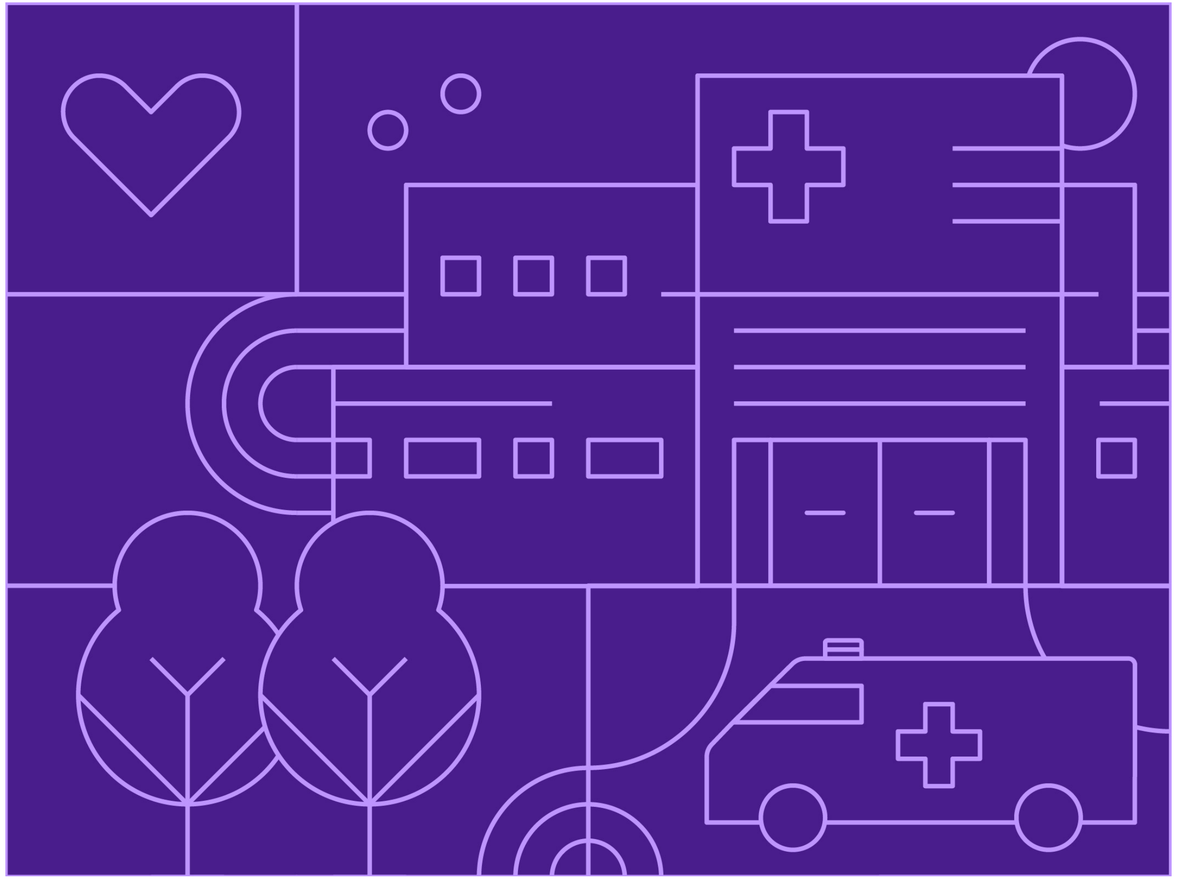
National Healthcare Group (NHG) is a leader in public healthcare in Singapore recognized for delivering high value patient care for 1.5 million residents in Central and North Singapore.

NHG faced a challenge in its human resource information system (HRIS), which was transaction-based, making it difficult to curate data for decision-making. The system also lacked mobile integration, hindering access to key information for employees on the move.

Solution

NHG collaborated with IBM Consulting®, SAP, and Synapxe to implement a new HR system, iConnect@NHG, which provided a centralized platform with self-service capabilities, enabling employees to personalize workspaces, access data for decision-making, and streamline HR processes.

The optimized workforce management with iConnect@NHG became a catalyst for improving patient care through empowered employees.



“iConnect@NHG has enabled our 22,000 staff to perform and manage HR transactions and tasks while on the move via their mobile phones. This allows our colleagues to spend more time on their core responsibilities, which includes providing care to our patients and the population that we serve, resulting in raised productivity and enhanced work satisfaction.”

Prof Chua Hong Choon
CEO, Khoo Teck Puat Hospital & Yishun Community Hospital

Read the full story →

California DHCS modernizes to streamline administrative processes.

The California Department of Health Care Services (DHCS) faced a significant challenge with its decades-old California Medicaid Management Information System (CA-MMIS) application, hindering progress and struggling to keep pace with evolving healthcare needs. DHCS partnered with IBM Consulting® to modernize the system, leveraging IBM's expertise and resources, including IBM Garage™ design thinking methodologies and an agile mindset. The collaboration resulted in the development of a cloud-based portal for CA-MMIS, improving provider satisfaction and streamlining administrative processes. The solution used IBM Consulting, Red Hat® OpenShift® on IBM Cloud®, and AWS consulting services to enable secure, scalable, and seamless hybrid multicloud connectivity.

Outcomes

- 96.7% Medi-Cal user volume on cloud
- 60% daily business transaction volume on cloud
- 76% legacy EOS/EOL applications migrated to cloud
- 30% delivery cost reduction from inception of cloud journey
- 5 new programs leveraging hybrid cloud
- 2+ average features deployed per week
- Over 3,100 organizations adopted paperless processes
- 30,000+ providers onboarded with faster service turnaround time

Solution components

Red Hat OpenShift on IBM Cloud

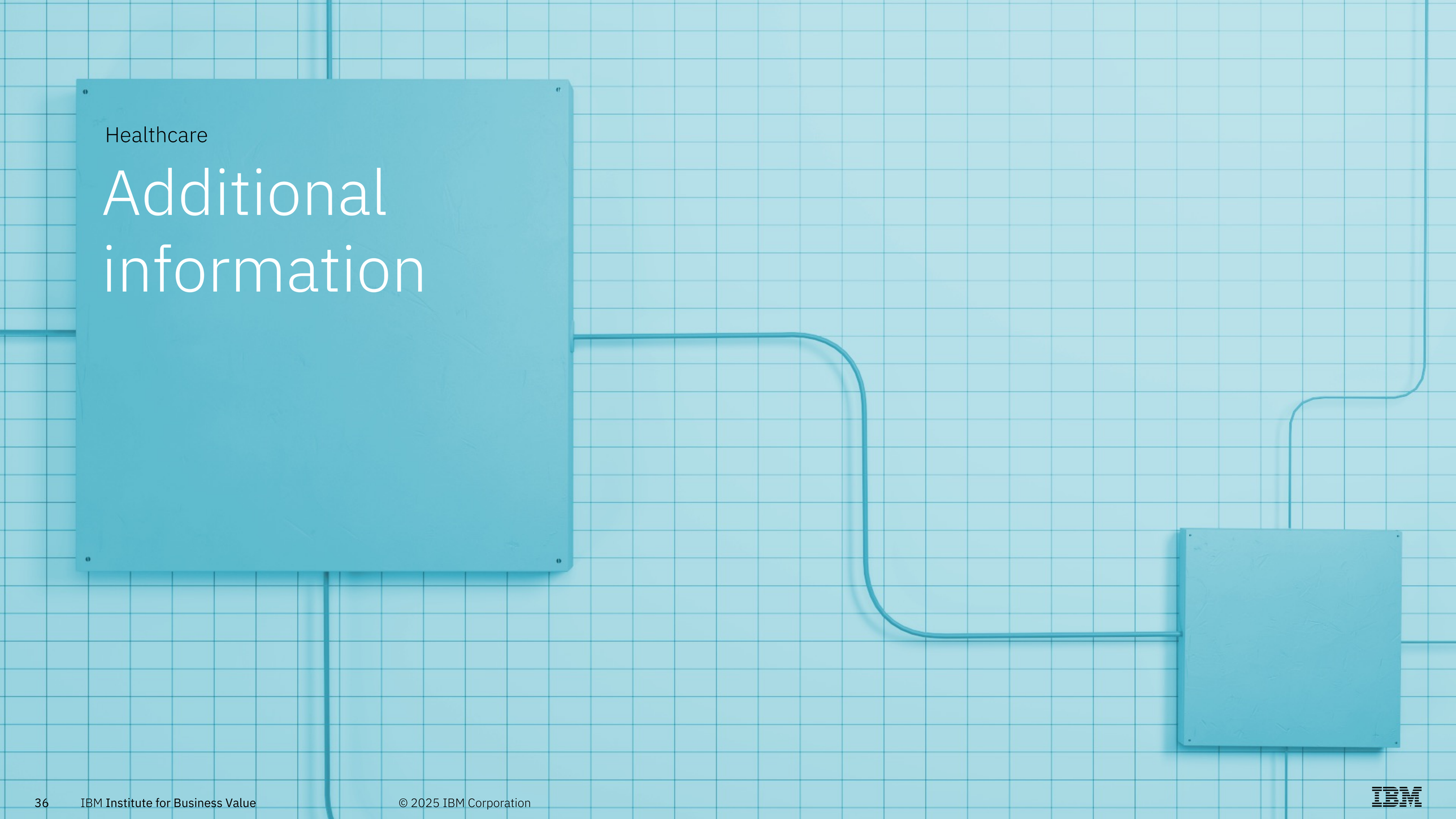
AWS consulting services

IBM Consulting

Read the full story →

Healthcare

Additional information



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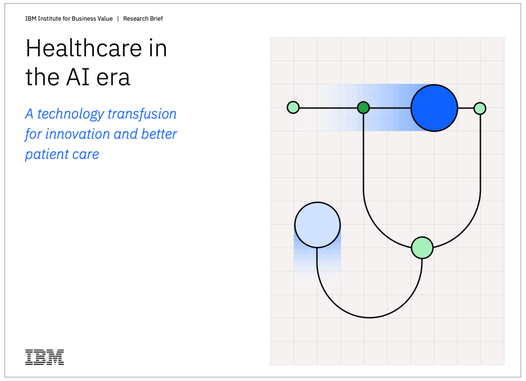
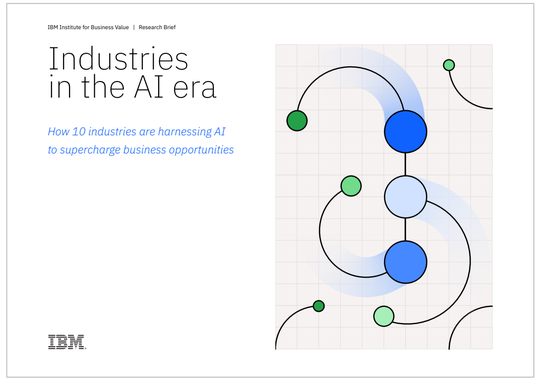
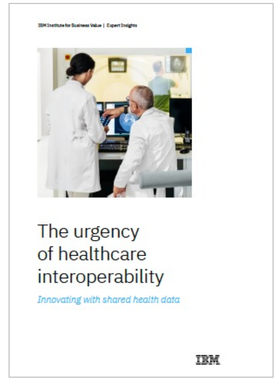


[Healthcare in the AI era]



[Industries in the AI era]
Includes a section on Healthcare industry

[Exploring quantum computing use cases for healthcare]



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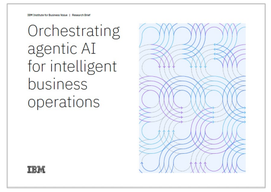

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[The ingenuity of generative AI]
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Related IBM publications for more insights:
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IBM Corporation
New Orchard Road
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Produced in the United States of America | September 2025

1443d5dc29cf44ce-USEN-00

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