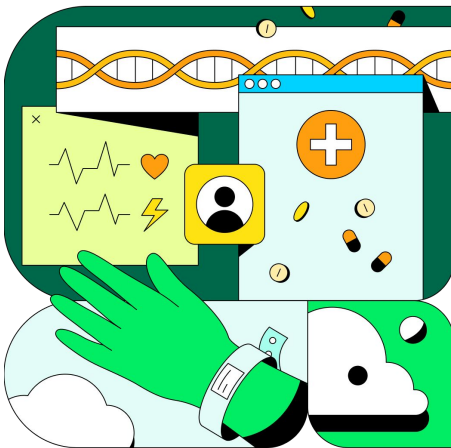




Modernizing Healthcare IT: Your Quick Guide

Solving data challenges for better patient outcomes

Navigating healthcare data



As the healthcare landscape evolves, **data** plays an increasingly critical role in improving patient outcomes, streamlining efficiency, and enabling groundbreaking innovation. However, managing healthcare data comes with its own set of complexities: massive volumes of data, diverse formats, interoperability requirements, security, and strict regulations.

To address these challenges, healthcare organizations need a modern data foundation that's flexible, scalable, and supports technologies like AI and machine learning. MongoDB, with its ability to handle diverse data and seamlessly integrate with other systems, is essential for innovation and improved patient care.

WEBSITE

[Visit mongodb.com/industries/healthcare](https://www.mongodb.com/industries/healthcare)

15.8% CAGR

projected market growth for the global healthcare IT market (2024-2030)

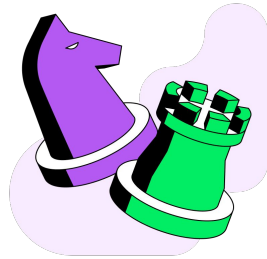
[1] [Healthcare IT Market Size Report, 2030 by Grandview Reports](#)



Table of Contents

PAGE

03

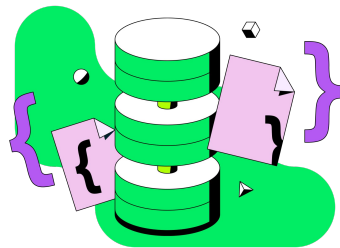


DATA CHALLENGES FACING HEALTHCARE

Addressing fragmented data and complex healthcare information systems.

PAGE

10



BENEFITS OF USING MONGODB

nifying healthcare data with flexible, interoperable solutions.

PAGE

06

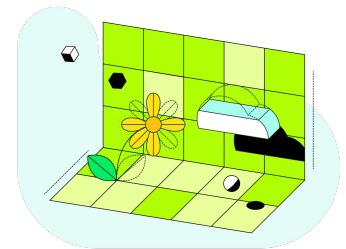


INDUSTRY IT INVESTMENT PRIORITIES

Key technology investments improving healthcare delivery and efficiency.

PAGE

15



THE POWER OF UNIFIED DATA

Transforming healthcare with advanced data integration capabilities.

Data Challenges Facing Healthcare



The healthcare industry faces an unprecedented confluence of data challenges driven by the increasing burdens of chronic diseases and aging populations, and rising patient expectations for more accessible, personalized, and proactive care. These factors place immense pressure on healthcare systems to operate more efficiently while striving for positive outcomes. Additionally, the need for broader and deeper insights has led to a rapid expansion of data volume and diversity, further driving the push to leverage artificial intelligence for enhanced decision-making, operational efficiency, and innovation.

Fragmented data and the challenge of patient-centric care

One of the biggest challenges in healthcare is the fragmentation of data across disparate systems, providers, and organizations. Examples include data from electronic health records (EHRs), medical imaging, lab information systems, pharmacy management platforms, telemedicine services, wearable devices, and specialized healthcare applications. Beyond technical silos, fragmentation also occurs between different levels of care, including primary care, specialized care, hospital networks, social care, and mental health services.

Additionally, inconsistent data models, privacy concerns, and technical limitations further complicate the ability to unify and exchange information efficiently. This fragmentation directly impacts patient-centric care, where a unified view of health data is essential for coordinated treatment.

Patients often face disjointed experiences—repeating their medical history to multiple providers or experiencing delays in care due to disconnected systems. For healthcare providers, data silos lead to inefficiencies, duplication of effort, and missed opportunities to deliver proactive and personalized care.

Complex, heterogeneous, and expanding healthcare data

Healthcare data is inherently complex and rapidly growing, encompassing structured data (numerical lab results), unstructured data (clinical notes), semi-structured data (FHIR resources), multidimensional data (medical imaging and genomic sequences), and time-series data (medical devices and sensors). In addition, AI-driven insights, metadata, and vectorized representations further enrich but also complicate data ecosystems.

As the volume of healthcare data expands exponentially—driven by the shift toward patient-centric care, precision medicine, advancements in genomics, IoT devices, and AI—traditional systems often struggle to scale efficiently. Whether integrating diverse patient data for personalized treatments, managing terabytes of genomic sequences, or processing real-time monitoring streams, healthcare organizations need flexible, high-performance architectures that can dynamically scale without compromising reliability or speed.

The challenge of interoperability

Interoperability remains one of the most pressing challenges in healthcare IT. With data originating from diverse sources, healthcare organizations must bridge multiple standards and protocols to enable seamless collaboration across providers, payers, and patients.

On average, a single hospital in the U.S. operates hundreds of applications, and just for EMRs, they must integrate an average of 16 different applications, as shown in the figure below. Most hospitals are part of larger healthcare groups, further increasing the diversity of systems.

To facilitate data exchange, frameworks such as FHIR (Fast Healthcare Interoperability Resources), HL7 v2/v3, DICOM for medical imaging, OMOP for research, and OpenEHR for structured clinical data have emerged—each addressing specific aspects of healthcare interoperability. However, even when adopting a common standard like FHIR, implementing and maintaining a high-performance, scalable system capable of managing real-world healthcare data remains complex. Many interoperability solutions focus narrowly on

regulatory compliance or basic data exchange, often lacking the capabilities needed for real-time workflows, high-performance analytics, or AI-driven insights.

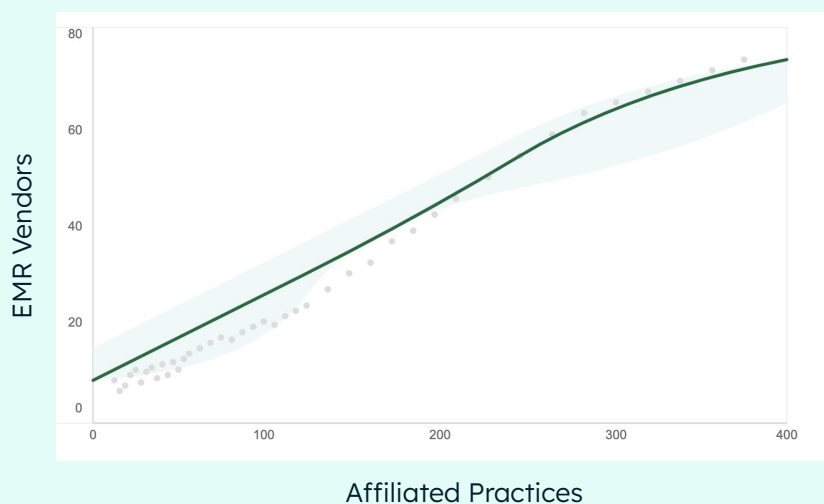
Moreover, interoperability is a continuous process, requiring ongoing updates, versioning management, and compatibility maintenance across evolving standards and existing healthcare applications.

This effort demands significant resources and, if not handled flexibly, can introduce new silos, vendor lock-in, and architectural rigidity—ultimately limiting the potential for innovation and scalability.

Regulatory pressures and data governance

Healthcare organizations operate under strict regulations, including HIPAA, GDPR, and local privacy laws. These regulations require robust data governance, ensuring that sensitive patient data is stored, accessed, and shared securely. However, achieving compliance while maintaining operational efficiency is a significant challenge, especially for organizations managing large, diverse datasets.

Figure 1. The average hospital in the U.S. has 16 different EMR vendors in use at affiliated practices.



16+
Average EMR Vendors
in U.S. Hospitals

100+
Applications per hospital

[2] [HIMSS Analytics](#)

AI's dependence on high-quality data

Artificial intelligence (AI), particularly generative AI (gen AI), has the potential to revolutionize healthcare by automating routine tasks, enhancing clinical decision-making, and personalizing patient care. However, AI is only as effective as the data it relies on.

Poorly structured, siloed, or incomplete data can lead to suboptimal AI models and unreliable insights. For example, an AI system designed to identify at-risk patients in a population health management program will fail if it cannot access consistent and complete data from across the care continuum.

Industry IT Investment Priorities

Understanding and prioritizing IT investment is crucial for organizations aiming to enhance patient care, streamline operations, and remain competitive. The global healthcare IT market was valued at over \$650 billion in 2023 and is projected to grow at a compound annual growth rate (CAGR) of 15.8% from 2024 to 2030. This growth is driven by the increasing adoption of electronic health records (EHRs), telemedicine, and AI-based tools. For instance, the U.S. has seen a significant rise in EHR implementation, with 96% of non-federal acute care hospitals adopting certified systems. Investments in digital health have been substantial, with over \$100 billion invested globally between 2020 and 2022.

Healthcare organizations are focusing their IT investments on several key areas to enhance patient care, operational efficiency, and data security. The following sections cover the key initiatives for near-term IT investments.

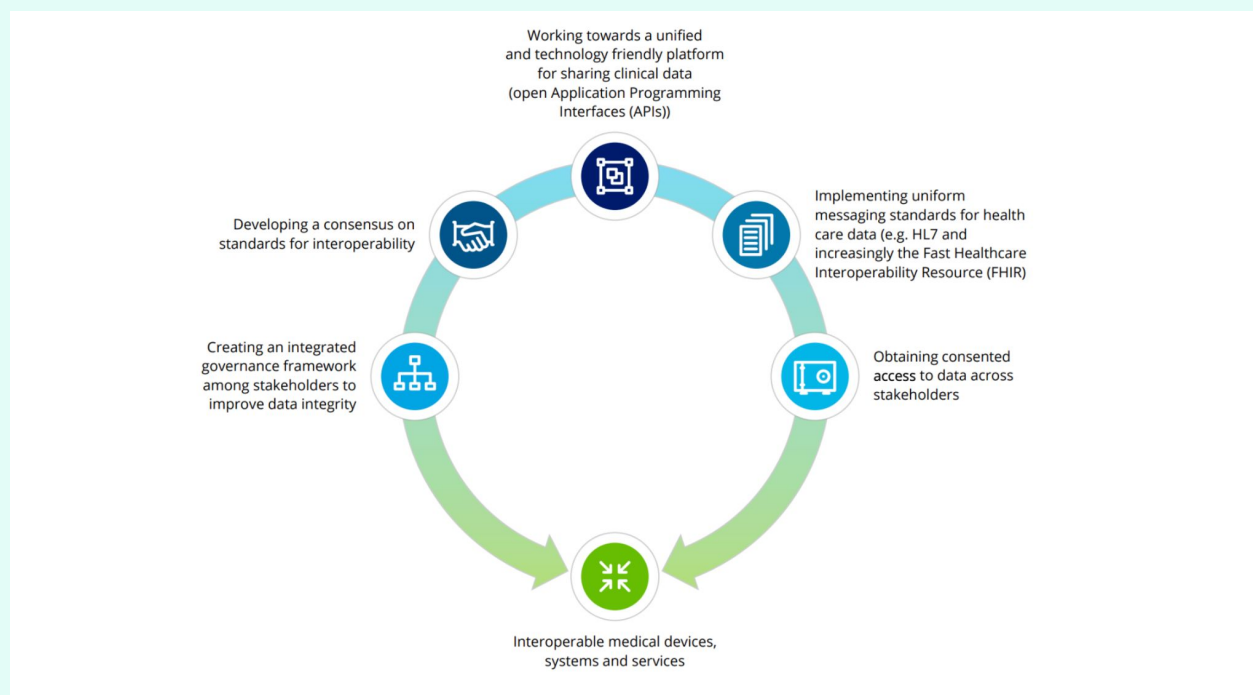
Interoperability and EHR Modernization

Electronic health records (EHRs) remain the backbone of healthcare IT, yet many legacy systems struggle with interoperability and user experience. As a result, 46% of providers are channeling resources into modernizing their EHR systems, integrating AI-driven analytics, and enhancing data sharing through FHIR-based APIs. These initiatives aim to improve clinician workflows and enable real-time data access for better patient outcomes. Healthcare systems often operate in silos, making it challenging to share patient data across providers, payers, and platforms. Interoperability ensures seamless data

exchange, improving care coordination and reducing errors.

Additionally, AI-driven solutions are being leveraged to transcribe clinician notes and enter data automatically, reducing administrative burdens and improving accuracy in medical records. This helps healthcare providers focus more on patient care while ensuring data consistency across systems. The global Healthcare Interoperability Solutions Market is forecasted to expand at 14.5% CAGR to reach a market valuation of \$16.2 billion by the end of 2033.

Figure 2. Key actions healthcare stakeholders should consider when tackling the interoperability challenge.



Digital and Remote Care Solutions

Digital health is reshaping patient engagement and care delivery. Around 32% of healthcare providers are expanding virtual care platforms, remote monitoring, and digital health tools to improve accessibility and chronic disease management.

Patient engagement technologies enable personalized interactions between patients and providers. Key initiatives include:

- **Digital front door:** Mobile apps and online portals streamline appointment scheduling, prescription refills, and real-time access to health records.

- **Remote monitoring:** Wearable devices and IoT sensors track vital signs and medication adherence, supporting early intervention and reducing hospital readmissions.
- **Virtual care:** Telehealth services and AI-powered assistants expand access to consultations, optimizing provider efficiency.

Investments in digital and remote care are powering AI-driven insights and stronger data infrastructure, ultimately improving patient outcomes while reducing costs and increasing healthcare accessibility.

Future health: profitability matters

“The focus of digital-health investments will continue to fundamentally change from top-line growth to profitability, one of my predictions for 2023 that continues to hold true. In 2023, we saw many digital-health players struggle. In an environment of high interest rates and low deal flow, those that have not sufficiently demonstrated a path to profitability will continue to face difficulties in 2024. On the flip side, investors have been piling into digital-health solutions that unlock cash across health care delivery, including value-based care, at-home care, and healthcare workflow solutions. This trend will continue.”

The Future of Digital Health 2024 BCG

Data Analytics, AI, and Population Health Management

Advanced data analytics and artificial intelligence are revolutionizing healthcare operations, from predictive diagnostics to administrative automation. Healthcare organizations are investing in analytics platforms to harness data for insights into patient populations, aiming to reduce readmissions, enhance preventive care, and streamline decision-making. Beyond long-term analysis, real-time analytics is becoming essential for optimizing resource allocation, improving response times in critical care settings, and automating workflows.

AI and machine learning enhance diagnostics, optimize treatment, and improve efficiency. Predictive and prescriptive analytics help anticipate patient needs, reduce administrative burdens, and refine clinical precision. AI-driven decision support and automation are central to digital health. Additionally, advanced search and NLP unlock insights from unstructured data, enabling rapid information retrieval, better research, and personalized medicine.

Patient Data Privacy and Compliance

With healthcare data breaches on the rise, robust cybersecurity measures have become a top investment priority. Safeguarding patient records and ensuring compliance with regulations like HIPAA and GDPR require sophisticated threat detection and response systems. In 2024, 55% of healthcare providers identified cybersecurity as their primary digital investment area, reflecting the critical need for advanced security frameworks. These strategic investments reflect a broader commitment within the healthcare industry to harness technology in order to improve patient outcomes.

The complexity of integrating creates additional security vulnerabilities, with each connection point representing a potential weakness.

To address these challenges, healthcare organizations are increasingly adopting holistic cybersecurity strategies that emphasize continuous monitoring and adaptive response mechanisms. This approach not only enhances data protection but also fosters a culture of cybersecurity awareness among healthcare professionals.

Summary driving forces behind healthcare IT investments

The healthcare IT landscape is rapidly evolving, with significant investments being made in interoperability, digital and remote care solutions, AI and analytics, and patient data privacy.

These priorities are driven by the need to improve healthcare professionals' experiences, enhance patient care, improve overall healthcare system efficiency, ensure data security, and comply with regulatory requirements.

Benefits of Using MongoDB

As the healthcare industry confronts the dual challenges of modernizing its systems and achieving true interoperability, MongoDB stands out as a transformative data platform. It empowers healthcare organizations to address their most pressing challenges—unifying fragmented data, enabling seamless interoperability, and unlocking the full potential of advanced technologies like AI and IoT—all while simplifying implementation and reducing operational overhead.

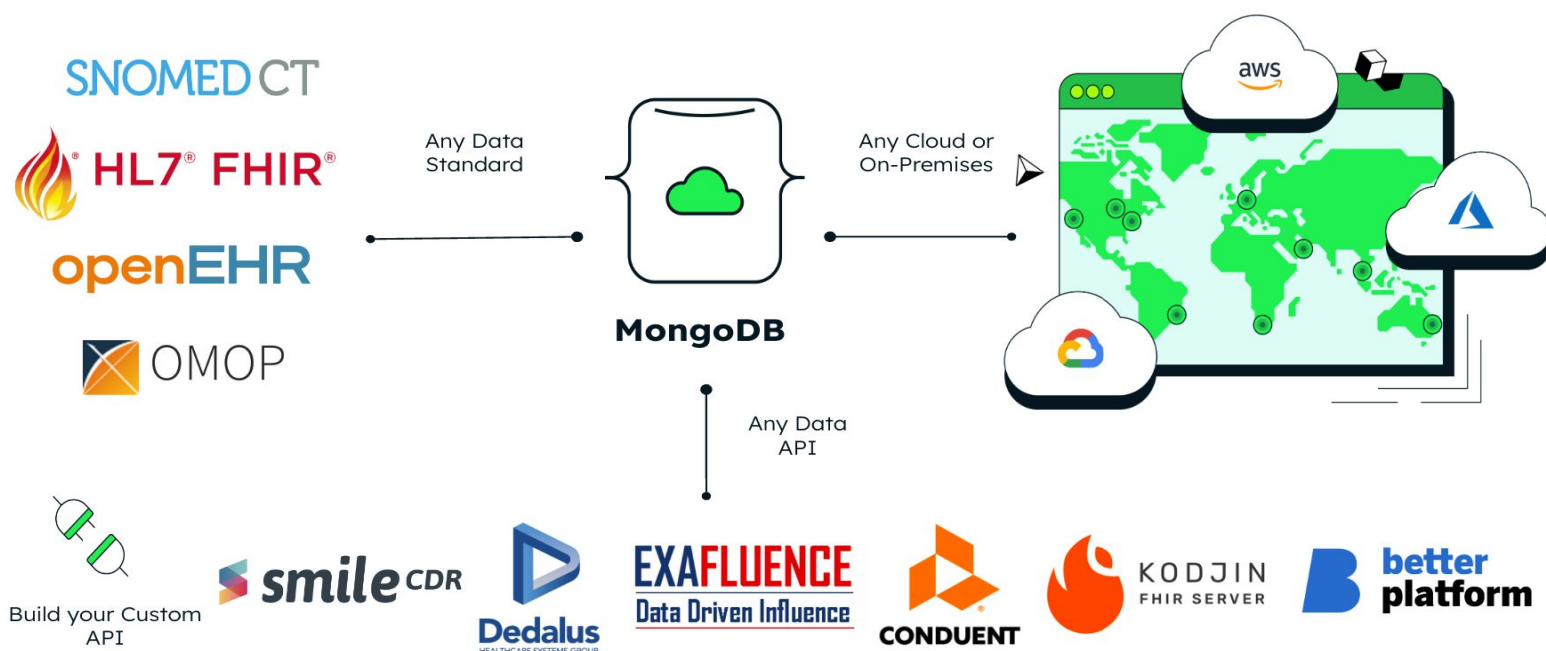


Figure 3. MongoDB: Centralizing healthcare data across systems.

A Unified Solution for Healthcare Data Complexity

Healthcare data is inherently complex. It spans structured, semi-structured, and unstructured formats, originating from diverse sources such as EHRs, medical devices, genomic sequencing, imaging systems, and patient portals. This data often resides in silos, limiting its utility for real-time clinical workflows, advanced analytics, or decision-making.

MongoDB's flexible document model is uniquely suited to this complexity. Unlike rigid relational databases, MongoDB accommodates diverse data types in a single, unified platform. For example:

- **FHIR resources:** MongoDB naturally maps JSON-based FHIR resources, enabling healthcare organizations to implement standards-compliant solutions while extending them with custom data fields for specific use cases.
- **Diverse protocols:** Beyond FHIR, MongoDB seamlessly integrates with other standards like DICOM, OMOP, and OpenEHR, creating a comprehensive repository that supports clinical, operational, and research needs.
- **Custom data:** MongoDB's schema flexibility allows healthcare organizations to store metadata, vector embeddings for AI applications, and operational data alongside clinical data without complex transformations.

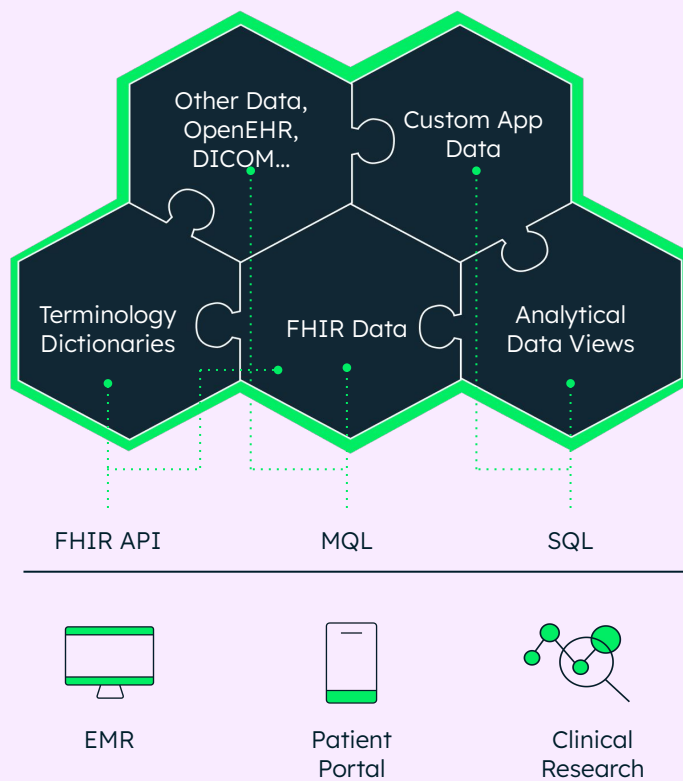
Interoperability without compromise

Interoperability is the backbone of modern healthcare, enabling timely and secure data exchange across systems, providers, and geographies. MongoDB bridges the gap between traditional architectures and the need for seamless data sharing:

- **FHIR-compliant APIs:** MongoDB supports native FHIR implementations while enabling extensions that adapt to evolving clinical requirements.
- **Integrated data exchange:** MongoDB allows organizations to consolidate patient data from multiple providers, labs, and wearable devices into a unified ecosystem, enabling 360-degree patient views.
- **Vendor neutrality:** MongoDB provides a vendor-neutral data platform, reducing the reliance on proprietary solutions and empowering healthcare organizations to retain control over their data.

By focusing on interoperability and flexibility, MongoDB allows healthcare organizations to modernize their data architectures without creating new silos or vendor dependencies.

Figure 4: MongoDB: Centralizing healthcare data across systems.



Novo Nordisk accelerates drug approval with gen AI and MongoDB Atlas

Novo Nordisk, a global leader in healthcare, is transforming how it brings new medications to market using generative AI and MongoDB Atlas. Known for its pioneering work in diabetes care, Novo Nordisk produces 50% of the world's insulin and serves millions of patients worldwide.

NovoScribe: Revolutionizing regulatory submissions

With the introduction of NovoScribe, the company has significantly reduced the time required to generate clinical study reports (CSRs), which is a critical step in the regulatory approval process.

NovoScribe, built on Amazon Bedrock, LangChain, and MongoDB Atlas, has enabled Novo Nordisk to reduce the time to compile CSRs **from 12 weeks to just 10 minutes**.

This innovation is helping Novo Nordisk get new medicines to patients faster, enhancing both the speed and quality of their regulatory submissions. By leveraging the capabilities of Atlas, NovoScribe automates complex data retrieval and analysis, allowing the company to scale its operations efficiently and securely across multiple cloud platforms.

“We’ve reduced the time taken to create clinical study reports from 12 weeks to 10 minutes, with higher quality outputs and a fraction of the team. In terms of value, each day sooner a medicine gets to market can add around \$15 million in revenue to the company.”

[Learn more](#)

Waheed Jowiya

Digitalisation Strategy Lead at Novo Nordisk

AI and Analytics-Ready Infrastructure

AI is reshaping healthcare, from clinical decision support to personalized patient care. However, AI's effectiveness depends on access to high-quality, integrated data. MongoDB is designed to meet the demands of AI and advanced analytics:

- **Real-time insights:** MongoDB's ability to process high-frequency data streams, such as IoT device outputs or genomic data, supports real-time analytics and clinical decision-making.
- **Vector search:** With integrated vector search capabilities, MongoDB enables semantic search across vast datasets, facilitating advanced AI use cases like natural language querying, patient cohort identification, and precision medicine insights.
- **AI-enriched applications:** MongoDB allows developers to store AI embeddings alongside operational data, ensuring seamless integration between AI models and the underlying data infrastructure.

This approach reduces operational complexity, enabling healthcare organizations to focus on leveraging AI for better patient outcomes rather than managing disconnected systems.



Cairns and Hinterland
Hospital and Health Service

CHHHS Advances Budget Management Compliance With Real-Time Analytics

Cairns and Hinterland Hospital and Health Service (CHHHS), a vital healthcare provider in Northeast Australia, is transforming how it manages budgets and compliance using MongoDB Enterprise Advanced. Serving over 250,000 people across diverse regions, CHHHS faced challenges with outdated systems and spreadsheet-heavy processes.

Real-Time Insights: Revolutionizing resource management

With the adoption of MongoDB, the healthcare provider significantly reduced the time required to generate financial and compliance reports, a critical step in ensuring resource allocation. Reports, once delayed until month-end, are now instantly available.

This freed up two full-time staff from manual data processing, shifting the focus on innovation.

[Learn more](#)

Scalable, Secure, and Compliant

Healthcare organizations face growing demands for scalability, security, and compliance. MongoDB is designed to meet these needs:

- **Dynamic scalability:** MongoDB's distributed architecture handles the exponential growth of healthcare data, from EHR expansions to IoT-generated time-series data, without compromising performance.
- **Robust security:** MongoDB offers advanced features like queryable encryption, client-side field-level encryption, and comprehensive auditing, supporting compliance with regulations like HIPAA and GDPR.
- **Global reach:** With MongoDB Atlas, organizations gain a global, cloud-native platform that supports hybrid and multi-cloud deployments, ensuring high availability and resilience.

Enabling Modern Healthcare Applications

MongoDB empowers healthcare organizations to innovate and deliver modern applications that transform patient care:

- **Telehealth and patient portals:** MongoDB supports real-time synchronization and personalization for telehealth platforms, wearable device integrations, and patient portals, enhancing engagement and accessibility.
- **Clinical trials:** MongoDB simplifies participant selection, real-time monitoring, and data integration for clinical trials, accelerating research and improving outcomes.
- **Hospital operations:** From optimizing patient flow in emergency departments to automating resource management, MongoDB enables smarter, data-driven operations.

The Power of Unified Data



The Data Backbone of Modern Healthcare

MongoDB is more than just a database—it's a unified, intelligent, modern database that simplifies healthcare IT modernization, ensures data interoperability, and supports cutting-edge AI and analytics. By choosing MongoDB, healthcare organizations can:

- Unify fragmented data into a single, flexible platform.
- Accelerate innovation with AI-ready infrastructure.
- Modernize their systems while retaining control over their data.

In an industry where data is the lifeblood of transformation, MongoDB is the natural choice for organizations looking to deliver better patient outcomes, drive operational efficiency, and remain at the forefront of healthcare innovation.



PNT Italia uses MongoDB to power
Italy's National Telemedicine
Platform

Built on MongoDB Atlas, Italy's National Telemedicine Platform ensures secure, scalable, and interoperable healthcare. With HL7 FHIR support and real-time data processing, it will serve 300,000+ patients by 2025, driving digital healthcare transformation.

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Contact your Sales Representative

