VERTIV.

E-book

Creating a modern digital backbone for global healthcare

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Global healthcare organizations are evolving data center architectures to support distributed care models, with real-time local data processing, robust edge infrastructure, and support for always-on services.

Healthcare is now a data-driven, always-on business

Healthcare has become patient-centered, data-rich, and digitally driven, enabling a vision of distributed, connected care across hospitals, outpatient facilities, diagnostic centers, and remote-care hubs.

Healthcare data volumes are growing fast, driven by market and business demands to expand medical imaging, electronic health records (EHRs), and continuous monitoring, as well as engage patients digitally. Global healthcare analytics are projected to grow at a 24.3% compound annual growth rate (CAGR) from 2024 to 2029, indicating that healthcare organizations (HCOs) are managing growing data volumes and business demand for analytics.[1] Leaders are under pressure to support always-on clinical systems, real-time imaging, and distributed care models – all of which increase density, uptime, and energy demand.

However, legacy infrastructures, including compute environments, power distribution, and cooling systems, are struggling to keep pace. Across regions, health system facilities teams frequently cite aging facilities and infrastructure among their top operational challenges[2] alongside rising costs and limited capital flexibility.[3] As a result, many HCOs face constraints in modernizing data platforms, supporting health data exchange, or scaling new digital services.

[1]Markets and Markets, 2025.
[2]Dudley, T., 2024. Spectrum Business.
[3]Dudley, ibid.

What this eBook covers

This eBook describes market pressures, the infrastructure realities behind them, and practical pathways HCOs are using to modernize safely and cost-effectively. It offers a lens into operational scenarios—from imaging suites to edge clinics—to demonstrate how infrastructure decisions (including delaying modernization) affect performance, resilience, and continuity of care.

Healthcare data and IT growth are outpacing infrastructure readiness

~30%
of global industry data is generated by healthcare, increasing stress on IT and facility infrastructure.[4]

Key data sources: *Electronic health records (EHRs), medical imaging, wearables, remote monitoring, clinical trials, genomics, and insurance claims.*

97%
of healthcare data is unused.[5]

Only 54%
of respondents report having an adequate infrastructure for health data exchange.[6]

Many report inefficiencies affecting imaging uploads or transfers due to network latency issues[7] or real-time alerts and notifications.[8]

[4]RBC Capital Markets, 2024.
[5]Weber, C., 2024. World Economic Forum.
[6]HIMSS, n.d.
[7]Dudley, ibid.
[8]Dudley, ibid.

Healthcare infrastructure is struggling to keep pace with strategic imperatives

HCOs are expanding digital services while managing growing volumes of data, including imaging archives, EHR records, and telehealth content, which have regulated storage requirements.[9] Globally, clinicians, patients, and members expect digital healthcare services to be always available, highly responsive, and digitally seamless.

These trends are increasing pressure on healthcare data centers and edge infrastructure globally. Key challenges include:

- **Addressing growing rack density:** Compute-intensive workloads, including imaging reconstruction, analytics, and clinical decision support, are driving higher rack densities. Across industries, average rack density has increased significantly in recent years, driven by data-intensive workloads.[10]
- **Solving power quality and redundancy constraints:** Many healthcare facilities may have aging electrical systems that were designed before HCOs began processing digital workloads. As a result, power quality variability across campuses and leased facilities creates risks for latency-sensitive and mission-critical systems that require continuous, stable power.
- **Mitigating thermal limitations:** High-load imaging and analytics environments generate concentrated heat that often exceeds the cooling capacity of legacy telecommunications rooms, intermediate distribution frames (IDFs), and repurposed administrative spaces. Managing this thermal risk effectively is critical to maintaining system reliability and compliance.

A business in transition

HCO business objectives for infrastructure include:

- **Supporting proliferating edge sites:** Healthcare systems are expanding outpatient clinics, ambulatory centers, and surgical centers. These sites all need local data processing to meet latency, availability, and data sovereignty requirements, but workloads are often processed in environments with limited space and inconsistent power.
- **Meeting high uptime requirements:** Healthcare increasingly operates as a real-time digital business. Infrastructure disruptions can delay digital imaging studies, slow lab workflow, interrupt clinician EHR access, and impact the coordination of emergency care.
- **Reducing costs and increasing efficiency:** Healthcare executives cite reducing operating costs as a top pressure, followed by improving employee productivity and enhancing service quality.[11] Infrastructure inefficiencies—particularly with power and cooling—directly impact financial and sustainability goals.

Improving edge capabilities for a healthcare technology company: In a 2020 deployment, centralized monitoring across 120 edge sites enabled earlier risk detection. While architectures have evolved, the operational benefits (visibility, uptime) are consistent with current best practices.[12]

[9]Relevant regulations: U.S.: The Health Insurance Portability and Accountability Act (HIPAA). EU and UK: General Data Protection Regulation (GDPR) and country-specific health data rules. EMEA and APAC: Additional requirements include the Singapore Personal Data Protection Act (PDPA), Australia's Privacy Act and My Health Records legislation, and healthcare-specific guidance from data protection authorities that shape how healthcare data is stored, protected, and used.

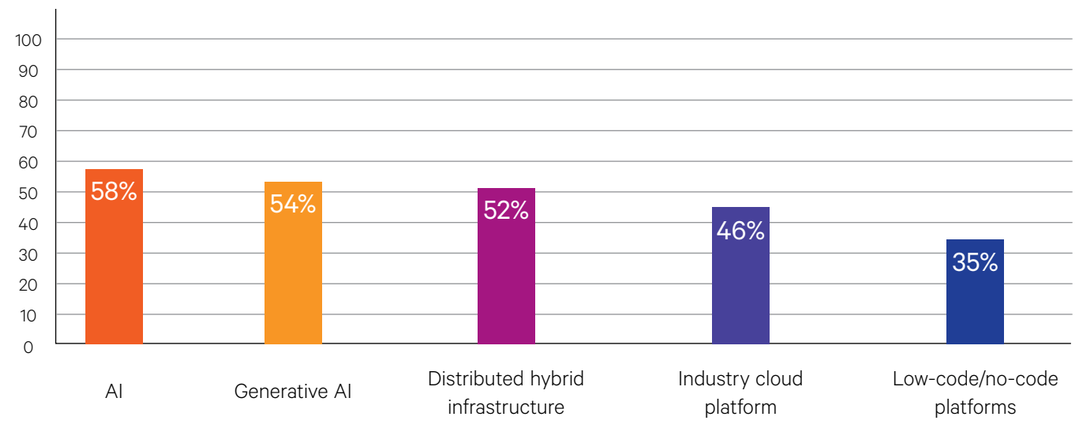
[10]AFCOM, 2024.

[11]Gartner. 2026.

[12]Vertiv. 2020.

Top 5 emerging technologies HCOs are adopting

The top five emerging technologies that healthcare providers have already deployed are: Supporting proliferating edge sites:[13]



[13]Gartner. 2026.

The operational reality: Aging facilities meet modern workloads

Healthcare IT infrastructure is often located in space-constrained environments, such as hospitals, legacy plant rooms, and edge locations where every square meter counts. Globally, healthcare facilities are aging. Longstanding facility surveys in the U.S. have documented persistent legacy electrical configurations in older hospitals. While comprehensive national updates are scarce, current master-planning and deferred-maintenance reports continue to highlight assets as a material operational constraint.[14]

10%: Average increase in the age of U.S. hospital plant infrastructure over the past two years.[15]

Historical constraints hamper modern business processes

Here's how these constraints are hampering different infrastructure demands:

- **Compute:** Healthcare workloads are shifting from general-purpose compute towards platforms that support imaging, analytics, and real-time processing. Many organizations are adopting hybrid models, keeping latency-sensitive workloads on-premises, while using cloud platforms for long-term archiving and analytics.
- **Power management:** Electrical infrastructure in healthcare facilities can vary widely across campuses and regions, creating operational risk. Main campuses have hospital-grade power, while leased facilities may rely on commercial power. Maintaining access to consistent, clean power delivery is critical for clinical systems that cannot tolerate dropouts or outages.
- **Thermal management:** Imaging clusters and analytics environments often exceed the design capacity of legacy cooling systems. Dense deployments in small rooms increase the risk of hot spots, airflow constraints, and inefficient cooling. Leaders are evaluating advanced cooling approaches, including hybrid air and liquid strategies, to gain the performance and reliability they require for digital services.

Meeting complex business and operational requirements

HCOs are also seeking to address:

- **Operational visibility:** Teams need to maintain visibility into power, cooling, and environmental conditions to identify and mitigate risks, perform root cause analyses, and perform proactive maintenance across distributed environments.
- **Space constraints:** Densifying racks may take a smaller footprint but require advanced power and cooling, which may be difficult to place in rooms that weren't designed for modern IT loads.
- **Energy efficiency imperatives:** Hospitals are the most energy-intensive buildings globally. Many healthcare systems are now facing regulatory or business mandates to reduce energy use and emissions while maintaining clinical reliability.

[14] *Health Facilities Management, 2025.*

[15] *American Hospital Association. 2025.*

Key use cases in healthcare

Top use cases for HCOs globally include:

- **Medical imaging expansion:** Magnetic resonance imaging (MRI), computed tomography (CT), and positron emission tomography (PET) systems generate data-intensive studies with every scan. Picture archiving and communication system/vendor-neutral archive (PACS/VNA) clusters require local compute and local failover. These workloads may be run in edge compute rooms adjacent to imaging suites, where thermal and power limits are most acute.

~100–500 MB: Data generated per CT scan with modality context.[16]

- **Expanding EHR and clinical systems:** Modern EHR systems operate continuously across inpatient, outpatient, and emergency settings. Their ongoing use can create predictable surges, such as during shift changes, that stress infrastructure in under-cooled or overloaded IDF/main distribution frame (MDF) rooms.
- **Growing distributed care and remote-care hubs:** The number of ambulatory surgery centers, urgent-care networks, specialty clinics, and community health centers is growing.[17] These sites require local processing for image capture, session caching, and monitoring. They often have limited space and variable power quality, demanding compact, resilient infrastructure to support operations.
- **Supporting data-intensive non-radiology specialties:** Genomics, surgical video, cardiology imaging, and continuous monitoring systems all increase local compute and storage demands, often in environments running legacy infrastructure.

Energy costs and emissions: Their operational impacts

Using 2018 CBECS as a historical baseline, US hospitals rank among the most energy-intensive building types. Recent benchmarking in 2022–2023 across EMEA/APAC indicates similarly high intensity, reinforcing the need for efficiency upgrades.

Infrastructure efficiency, power quality, and advanced cooling strategies are needed to maintain HCO operational resilience and sustainability.

[16] *Shakor, M., and Khaleel, M., 2024.*

[17] *Grandview Research. The global market for ambulatory surgery centers will grow from around $135B in 2023 to around $206B by 2030. Ambulatory Surgery Centers Market (2024 - 2030). In the US, the number of urgent care centers grew nearly 100% from 2014 to 2023. See Trilliant Health. (May 12, 2024). The Marked Shift in Urgent Care Utilization: Two Years Later.*

Infrastructure requirements for modern healthcare workloads

As HCO workloads densify and care gets more distributed, IT infrastructure must evolve to meet performance, resiliency, and efficiency requirements, often within existing facilities.

- **Power capacity, distribution, and quality:** Teams want to maximize existing capacity while modernizing aging power infrastructures. A good place to start is in modernizing low- and medium-voltage (LV/MV) distribution, which determines how effectively to deliver power to dense racks without overloading them or stranding capacity. By using monitoring solutions and modular power architectures, teams can align supply with demand across sites.
- **Thermal management and rising density:** High-density workloads often exceed the limits of legacy, air-only cooling designs. Many organizations are evaluating hybrid cooling strategies that combine air and liquid approaches to improve heat removal while minimizing disruption.
- **Space constraints at the edge:** To address space constraints, HCOs are deploying compact, pre-integrated infrastructure to introduce capacity into small rooms, clinics, and remote sites, speeding deployment while avoiding extensive construction that disrupts operations.
- **Resiliency and operational continuity:** HCOs require that infrastructure support continuous clinical operations. Using remote monitoring systems to gain visibility into power, cooling, and environmental conditions enables teams to respond faster to risks, while also managing hybrid environments with local and cloud resources.
- **Efficiency and energy management pressures:** As HCOs face rising energy costs and increased emissions targets, they are pursuing smarter energy management, storage, and optimization strategies that improve efficiency without compromising uptime.

Cooling workloads more efficiently

In a 2020 deployment, a leading U.S. healthcare systems provider upgraded 63 data center cooling units to reduce its environmental impact. The project saved three million kilowatt hours in three years and generated more than $1M in savings and rebates.[18]

[18] *Vertiv, 2020.*

A phased approach for IT modernization

Modernization initiatives are often constrained by cost, risk, and operational disruption. As a result, many HCOs use a phased strategy to bring new capabilities on board:

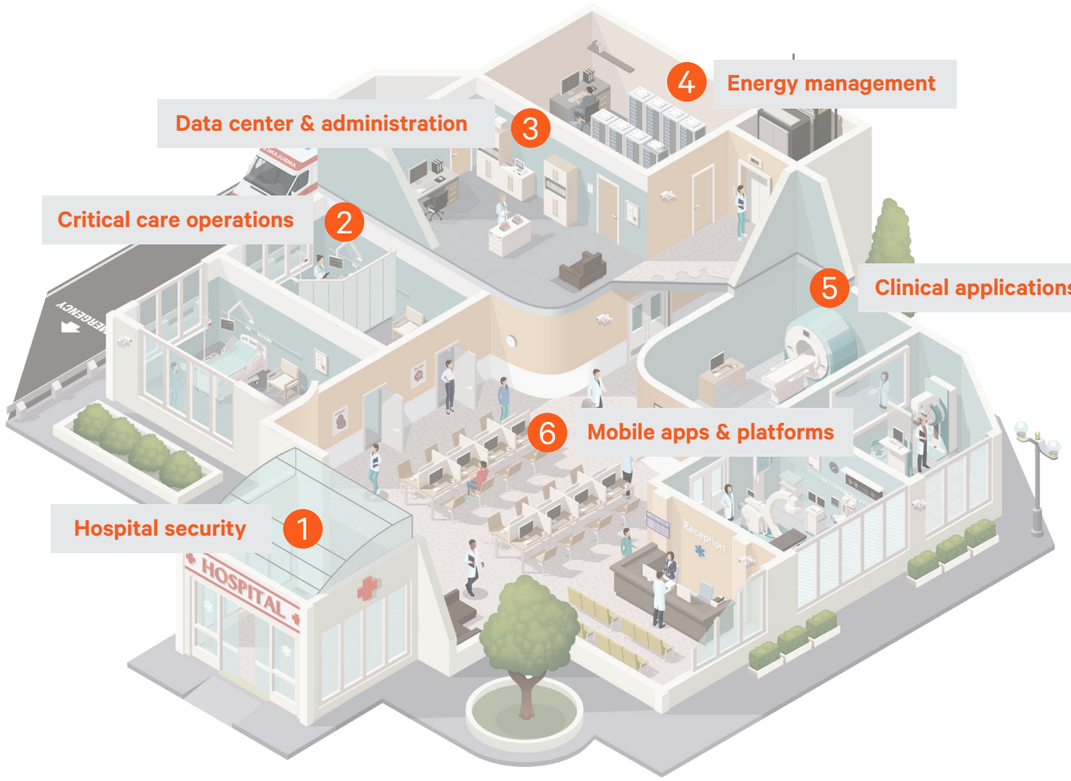
1. **Leverage assessment frameworks:** Use capacity planning, facility-condition assessments, and workload mapping to identify constraints.
2. **Take a phased approach to modernization:** Prioritize mission-critical and fast-growing workloads. Use modular or scalable architectures to modernize edge environments, while limiting disruption.
3. **Balance on-premises and cloud:** HCOs need both approaches: maintaining local infrastructure for latency-sensitive, regulated workloads, while leveraging cloud platforms for scale and analytics.

Decision criteria for modernizing healthcare infrastructure

Healthcare leaders increasingly evaluate infrastructure investments through five strategic imperatives. Each imperative reflects how digital healthcare initiatives translate into concrete data center requirements.

Strategic imperative	Use case examples	Infrastructure implications
Be transformative	• Drug discovery and testing • AI-assisted clinical decision support • High-fidelity simulations for research and treatment planning	• Cross-functional infrastructure expertise spanning IT and facilities • Holistic solution design that integrates compute, power, cooling, and monitoring • Platforms that support collaboration across clinical, research, and operational teams
Be efficient	• Automated scheduling, billing, and claims processing • Intelligent resource and asset utilization across facilities • Streamlined administrative and support operations	• Extend the value and function of existing systems • Close-coupled power and cooling designs that minimize space, energy use, and operating cost • Infrastructure that improves utilization without introducing operational risk
Be first	• Scaling digital front-door tools (self-service, mobile, virtual care) across facilities • Standardized edge-to-core environments supporting multi-site operational expansion	• Designs that reduce deployment time and implementation risk • Pre-configured or modular systems that accelerate time to service • Repeatable architectures that can be deployed consistently across sites
Be confident	• Enhanced diagnostics and imaging • Accurate and complete clinical documentation • Operational complexity and staffing	• Proven, resilient infrastructure solutions that support continuous uptime • Comprehensive services, monitoring, and lifecycle support • Designs that reduce failure points in mission-critical environments
Be future-ready	• Precision medicine and personalized treatments • Holographic and hybrid imaging • Digital twins in healthcare • Immunomics and synthetic biology	• Interoperable platforms that integrate with evolving technologies • Scalable, upgradable architectures that adapt to rising density • Infrastructure designed for long-term flexibility, not single workloads

Supporting the growing healthcare network



1. Hospital security

From video surveillance systems to access control, physical security systems are essential to today's hospitals. Vertiv has the solutions to protect the systems that protect patients and staff.

- Integrated rack system
- High-performance KVM switch

2. Critical care operations

Operating rooms and other critical operations require continuous power and precise environmental control. Learn more about Vertiv™ solutions.

Operating room infrastructure

- Power conditioning and backup
- Monitored rack PDU
- Custom air handlers

3. Data center & administration

- Data center
- Online management of patient record
- Blocking system
- E-prescription IT systems

4. Energy management

Inside and outside the hospital

- Reduce fault rates and lower operating costs
- Enable energy savings
- Improve network flexibility and efficiency

5. Clinical applications

Diagnostic and imaging equipment represents one of the biggest investments many hospitals make. Vertiv™ power continuity solutions can help you get the most from your investment.

Diagnostic equipment infrastructure

- Modular power conditioning and backup

6. Mobile apps & platforms

- Health & data records for patients

Digital healthcare requires a modern, fit-for-purpose infrastructure

Healthcare delivery requires real-time digital processes that rely on resilient, efficient infrastructure that delivers performance and continuous uptime. As HCOs expand imaging, clinical systems, and distributed care models, the decisions that leaders and teams make will directly impact system performance, safety, and continuity of care.

By modernizing power, cooling, and infrastructure in line with business priorities and budgets, HCOs can improve operational reliability, strategically manage energy use, and support future growth without overbuilding or disrupting care delivery.

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