DHA ANALYTICS | CHIME Digital Health most wired Survey

INFRASTRUCTURE TREND REPORT

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Digital Health Analytics (DHA) is a global market intelligence and survey research hub for digital health technology. Provided by the College of Healthcare Information Management Executives (CHIME), DHA was created in 2022 as the gateway for provider organizations and companies to better understand how digital technology supports leaders in transforming health and care and delivering data insights that help them make the greatest business impact possible.

The Digital Health Most Wired Survey and Infrastructure

Healthcare's digital journey has entered a new phase marked by intelligent, automated technologies and increasingly sophisticated cyber risks. In today's consumer-centric, market-responsive climate, technology and operations are inseparable. As CIOs and other healthcare leaders strive to keep pace with technology and dramatic shifts in care delivery models, infrastructure has transformed from a support function to a critical enabler of modern healthcare. Providers deliver care, and infrastructure delivers digital health capability. As such, this enabling technological framework is the backbone of healthcare's digital transformation, ensuring secure, efficient, and innovative care delivery.

CHIME's 2024 Digital Health Most Wired survey findings confirm that infrastructure is a top priority for healthcare providers — jumping to 3rd from 5th on the top priority list — as they pursue digital health transformation and strive to achieve the goal of "care anywhere." Providers recognize the increasing importance of a dynamic, scalable, and secure infrastructure to leverage technology to deliver care wherever the patient is located, whether that's at home, at work, or on the go.

However, this transformation is not without its challenges. The care anywhere revolution will see more mobile and remote monitoring devices trying to access networks and data from inside and outside of provider campuses, more automated and AI-driven tools accessing EHR systems, and more cyber safeguards deployed. Additionally, budget constraints, particularly in smaller organizations, can limit the ability to invest in robust infrastructure solutions. And governance gaps can hinder the effective management and oversight of increasingly complex infrastructure environments.

Crucially, three emerging trends are reshaping the role of infrastructure in future-ready healthcare: the shift to delivery of care driven by mobility and remote technologies, the evolution of cloud as the new datacenter enabling scalability and efficiency, and the rise of identity as the new perimeter to secure decentralized ecosystems.

This report will explore these themes alongside key Infrastructure segment findings — from an emphasis on patient engagement to meet healthcare consumerism demand and integration of patient wearables and patient-generated health data (PGHD) with EHRs to expanded bring your own device (BYOD) policies and more robust recovery capabilities — to show how these benchmarks of digital health progress address the trends and challenges driving healthcare providers' need for scalable, secure, and future-ready infrastructure solutions.

The growing need for strategic partnerships to help drive infrastructure modernization will also be addressed. "The best service providers understand the network demand and management complexity created by the proliferation of devices," said Andrew Craver, Vice President of Segment Marketing, Spectrum Business. "They work in tandem with healthcare leaders to deliver sound infrastructure solutions offering robust automation, layered security, data prioritization and scalable capacity."

This report is sponsored by Spectrum Business®, a national provider of scalable, fiber-based nextgen technology solutions that enable the delivery of innovative healthcare. Spectrum Business understands the critical role of reliable and secure infrastructure in supporting the digital transformation of healthcare organizations. Consequently, 90% of the largest health systems in the U.S. rely on Spectrum Business for technology solutions.

1 Infrastructure's Role in Delivery of Care Anywhere

The profound shift towards consumer-centric care means delivering personalized, virtual care wherever the patient is – at home, at work, or on the go. This transition is fueled by advancements in mobility, telehealth, and remote patient monitoring, all of which rely heavily on a robust and adaptable digital infrastructure.

Intermountain Healthcare's rapid expansion of telehealth services during the COVID-19 pandemic exemplifies the critical role infrastructure plays in this new era of care delivery.

Faced with the need for rapid scalability, ensuring patient technology access and literacy, integrating telehealth into existing workflows, and navigating licensing and reimbursement complexities, Intermountain implemented several solutions. They invested in expanding their telehealth platform, including video conferencing and remote monitoring tools, and provided extensive patient education and technical support. Clinical workflows were redesigned to seamlessly incorporate telehealth, and the organization actively advocated for supportive policy changes.

These efforts led to a significant increase in telehealth utilization, expanding care access for rural patients and individuals with mobility challenges. Intermountain achieved higher patient satisfaction scores, streamlined clinical workflows, and strengthened its infrastructure's ability to support virtual care delivery at scale — demonstrating how targeted infrastructure investments can transform care delivery, even in times of crisis.

To successfully implement and scale telehealth services like those at Intermountain, healthcare providers need to consider a range of critical infrastructure components. This includes bolstering network capacity to accommodate increased data flow from video conferencing and remote monitoring. Optimizing data transfer protocols is also essential to ensure smooth and efficient communication between patients and providers. Additionally, leveraging cloud-based solutions can provide the flexibility and scalability needed to handle the evolving demands of virtual care delivery.

Intermountain's experience offers a valuable lesson for healthcare organizations (HCOs) navigating the complexities of telehealth adoption. It underscores the need for a holistic strategy that encompasses not only technological upgrades but also a deep understanding of patient needs, workflow optimization, and a commitment to shaping a supportive policy environment. By investing in a robust and scalable digital infrastructure, HCOs can unlock the full potential of telehealth to transform care delivery and improve patient outcomes.

Infrastructure is a Higher Priority for Digital Health Transformation

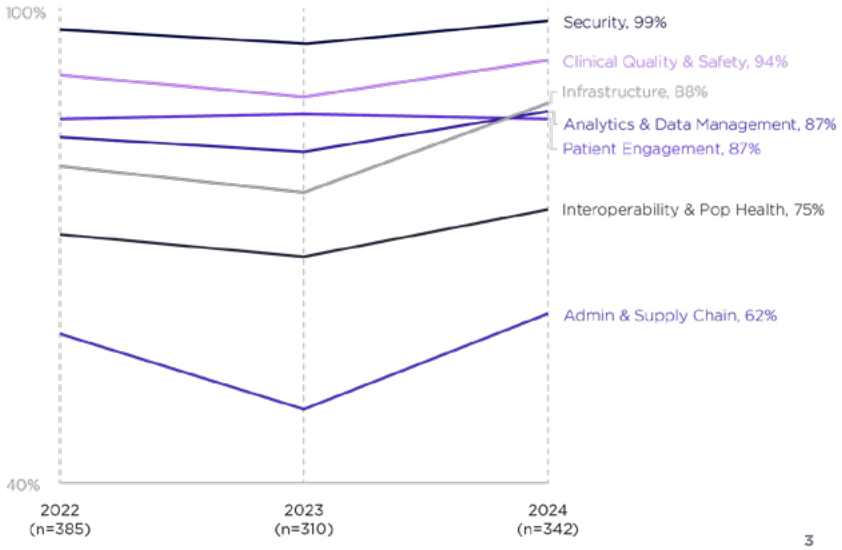
While security and clinical quality and safety remained the top two priorities among Most Wired organizations, this year's data revealed infrastructure is a higher priority for digital health transformation than at any point in the past three years: 88% of providers called infrastructure an essential or high priority area, compared to 77% of providers in last year's survey.

"This surge in prioritization is driven by several factors, including the need to support enterprise-wide EHR migrations, the increase in the use of various devices (both employee-owned and organization-owned), and the growing demand for integration with patient devices (medical and consumer)," explained Toni Laracuente, Senior Director of Analytics for CHIME.

As HCOs expand their digital initiatives and explore new care models like hospital-at-home and remote patient monitoring, the need for a robust and adaptable infrastructure has become paramount.

Digital Health Transformation Priorities Over Time

Percent who say area is an essential or high priority over time



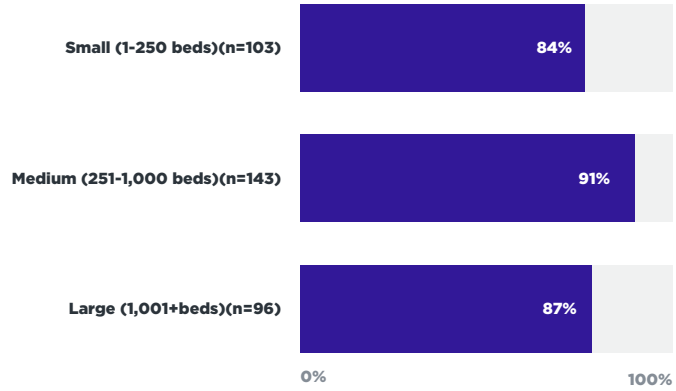
There's an inflection point where managing technology complexities can outweigh the benefits and distract health systems. "To overcome this, healthcare organizations should seek managed solutions that integrate all necessary technology within one tailored solution," Craver advised. "The right partner leverages its scale and expertise to design, deploy, and manage the network, saving clients time and money while allowing IT teams to focus on patient care."

Medium-Sized Organizations Prioritize Infrastructure Investment

Medium-sized organizations (251 to 1,000 beds) are most likely to prioritize infrastructure investment: 91% of medium providers compared to 87% of large (more than 1,000 beds) and 84% of small providers (250 beds or fewer). This may be because medium-sized organizations are at a critical stage of growth where they need to scale their infrastructure to accommodate expanding operations and digital initiatives.

Infrastructure Priority by Organization Size

Percent who say area is essential or high priority (n=324)

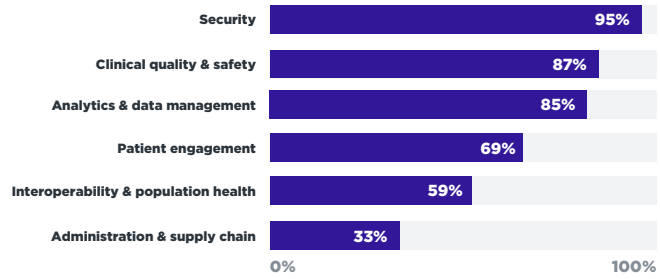


Prioritizing Infrastructure Drives Patient Engagement

The survey reveals a clear correlation between infrastructure investment and successful patient engagement initiatives. Organizations who deemed infrastructure an essential or high priority (89%) also held patient engagement as a high priority. Contrarily, respondents who considered infrastructure a low or medium priority saw their patient engagement priority dip nearly a third lower than those prioritizing infrastructure.

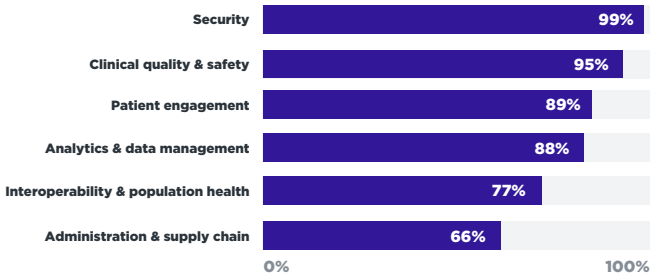
2024 Priorities—Low/Medium Infrastructure Priority

Percent who say area is essential or high priority (n=39)



2024 Priorities—High/Essential Infrastructure Priority

Percent who say area is essential or high priority (n=303)



"HCOs that prioritize infrastructure are better equipped to leverage technology for patient-centric care," Laracuente said. "This includes the use of devices, telehealth, and other digital tools to enhance the patient experience and improve outcomes."

In a patient-centric care environment, Patient Reported Experience Measures (PREMs) and Patient Reported Outcome Measures (PROMs) are essential tools for understanding and addressing the needs of individual patients. A robust infrastructure is essential for effectively collecting, analyzing, and utilizing this patient-generated data to improve care quality and patient satisfaction. This infrastructure should support the integration of PREM and PROM data with EHRs and other healthcare data sources to create a more holistic view of the patient.

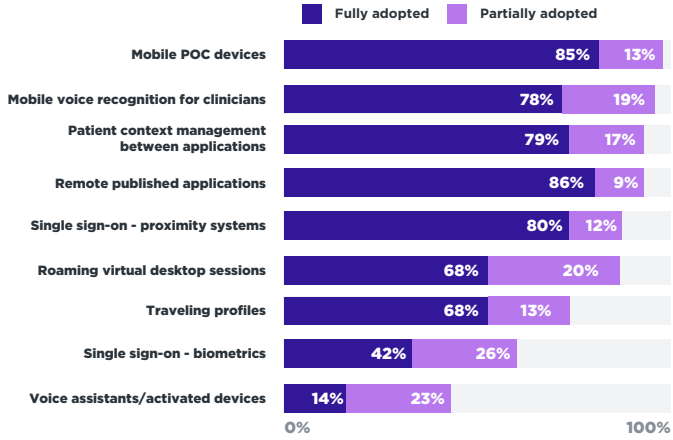
Technology Adoption to Improve Caregiver Workflow

The use of devices to support caregiver workflows and deliver patient care is on the rise. The 2024 DHMW survey shows a significant increase in the adoption of technologies such as mobile point-of-care (POC) devices and mobile voice recognition for clinicians.

As care anywhere models become more prevalent, technologies that support remote care and patient engagement are seeing increased adoption. This is reflected in the high full adoption rates of technologies such as mobile POC devices and telehealth platforms. These tools empower caregivers to deliver care remotely, access patient information in real time, and facilitate communication and collaboration.

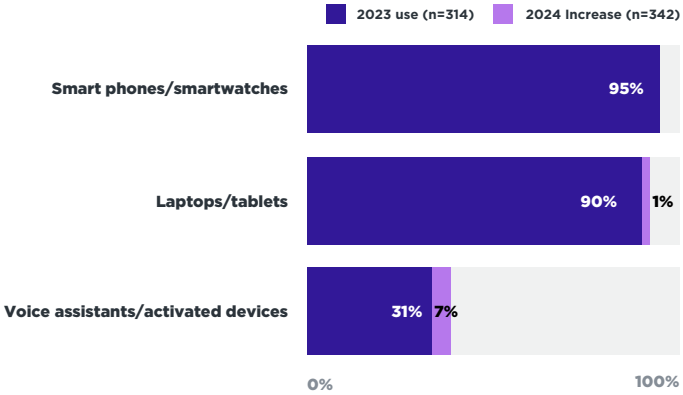
Technologies to Improve Caregiver Workflow

Percent with fully or partially adopted (n=342)



Clinical Staff's Authorized Use of Employee Devices in Patient Care

Percent with either extensive or limited use



While some technologies have been readily embraced, others are experiencing slower adoption rates. For instance, despite their potential to streamline workflows and enhance security, voice assistants and biometric single sign-on (SSO) show low overall adoption. This could be attributed to factors such as cost, integration challenges, or perceived lack of immediate value. However, it's worth noting that organizations prioritizing infrastructure are more likely to adopt these technologies, suggesting that a robust infrastructure may be crucial for facilitating their integration and effective utilization.

An interesting trend emerges when examining the gap between partial and full adoption of certain technologies. Roaming virtual desktops exhibit the largest gap (20%) among technologies with high overall adoption. This discrepancy could indicate implementation challenges, such as ensuring seamless access and performance across various devices and locations. It could also suggest a need for further training and support to ensure caregivers can fully leverage the capabilities of roaming virtual desktops.

The Importance of Infrastructure in Care Anywhere Delivery

The successful adoption of telehealth, remote monitoring, and patient engagement technologies underscores the critical role of a flexible and scalable infrastructure.

Virtual nursing is another trend gaining traction in care anywhere delivery. A recent survey from Avasure indicated that 74% of hospital leaders believe virtual nursing will be integral to acute care delivery models. The successful implementation of virtual nursing programs relies heavily on robust infrastructure: High-quality video conferencing, reliable connectivity, and secure data transfer are essential for enabling effective virtual interactions between patients and nurses.

As HCOs expand their care delivery models, they require infrastructure solutions that can scale rapidly, support increasing data demands, and improve operational efficiency. Cloud computing offers the flexibility and cost-effectiveness needed to support modern healthcare workflows.

2 Infrastructure in the Cloud Age: Scalability and Efficiency in Action

The healthcare landscape is rapidly evolving, with increasing demand for flexible, scalable solutions that can support the delivery of care anywhere. Cloud computing has emerged as a critical enabler of this transformation, offering a range of benefits that traditional on-premises infrastructure struggles to match.

"In addition to scalable and resilient core transport … our clients are looking for a complete solution that also delivers on security and resiliency needs to set them up for success in meeting regulatory and business continuity requirements," Craver noted.

HCOs are increasingly adopting hybrid and multi-cloud models to optimize their infrastructure for scalability, cost-efficiency, and data sharing. These approaches allow HCOs to leverage the strengths of different cloud providers while maintaining control over sensitive data and critical applications. This flexibility is critical for supporting care anywhere initiatives and accommodating the complexity of modern healthcare operations.

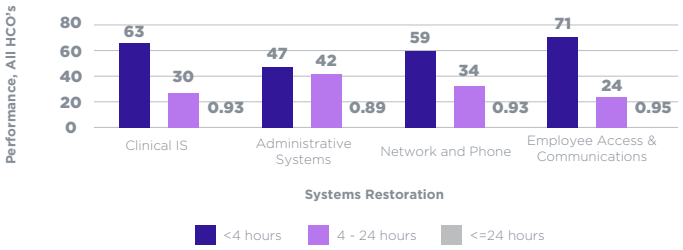
2024 DHMW Insights: Disaster Recovery and Technology Adoption

The 2024 Digital Health Most Wired (DHMW) survey highlights related trends that demonstrate the cloud's growing role in healthcare infrastructure:

Disaster Recovery Readiness - Most organizations can restore mission-critical operations within 4 hours of a data center loss, a clear indication of reliance on cloud-based backup and recovery solutions.

Service Restoration Following Disaster

In the event of a complete loss of primary data center



Technology Adoption - Cloud-enabled technologies such as telehealth platforms and mobile POC devices are increasingly adopted to enhance clinical and operational workflows.

To ensure the effectiveness of these solutions, robust service-level agreements (SLAs) with technology partners are essential, ensuring performance, uptime, and timely issue resolution. In addition to enhancing disaster recovery readiness, SLAs can support the seamless adoption of new technologies, ensuring business continuity and operational efficiency.

Operational Benefits: Cost Reduction, Scalability, and Interoperability

Cloud adoption provides significant operational benefits, including reduced infrastructure costs, improved scalability to accommodate demand fluctuations, and enhanced interoperability across systems and departments. Workload placement strategies form a key step in optimizing cloud adoption.

By moving certain applications to the cloud, El Camino Health in Mountain View, California, improved latency issues for radiologists working remotely, showcasing the cloud's value in enabling real-time access to critical applications, especially among an increasingly distributed workforce.

Facing challenges with an outdated network that lacked scalability, flexibility, and security, Atlantic Health System undertook a comprehensive modernization initiative. Key solutions included deploying Wi-Fi 6 for faster, more reliable connectivity, implementing software-defined networking (SDN) for centralized management and automation, and migrating applications to the cloud for improved scalability and cost-effectiveness. Enhanced security tools, such as intrusion detection systems and security information and event management (SIEM), further strengthened their defense posture.

These investments delivered tangible benefits:

- Improved patient experience through reliable Wi-Fi access that facilitates telehealth and remote monitoring.
- Anywhere care delivery, supporting telehealth, remote work, and innovative care models.
- Greater operational efficiency enabled by SDN automation and streamlined network management.
- Enhanced security posture, reducing cyberattack risks and protecting critical systems.

Atlantic Health System's experience demonstrates how strategic infrastructure modernization can drive better patient care, operational agility, and stronger cybersecurity.

"Leading healthcare organizations increasingly prioritize the most secure, dedicated connectivity to their cloud environments," Craver said. "This means ensuring critical applications and data are accessed through a dedicated Layer 2 connection that doesn't traverse the public internet. Many organizations don't realize that even with encryption, accessing cloud resources via the public internet to reach introduces significant risk. This highlights the criticality of evaluating all options when seeking robust, reliable, and inherently secure connectivity solutions."

Emerging Technologies: AI and Predictive Analytics in the Cloud

Artificial intelligence (AI) and predictive analytics are revolutionizing healthcare operations, and their success depends heavily on cloud computing. Cloud platforms provide the computing power needed to scale these resource-intensive technologies, supporting advanced decision-making, workflow optimization, and improved patient care.

However, the increasing use of AI and machine learning in healthcare necessitates a corresponding increase in bandwidth capacity. As these technologies analyze vast datasets and perform complex computations, HCOs must ensure their infrastructure can handle the growing data demands.

University Health, one of the top five U.S. transplant centers, has partnered with the Parkland Center for Clinical Innovation (PCCI) to develop the Transplant Quality and Research DataMart. This platform integrates AI with clinical expertise, enhancing the digital data environment to support advanced analytics and transformative research. Serving a wide range of patients in kidney, liver, and lung transplantation, University Health's comprehensive transplant operations benefit significantly from this innovative approach.

By leveraging AI and predictive analysis, the DataMart provides care teams with actionable insights to improve patient outcomes and streamline clinical workflows. This centralized, cloud-based system supports research breakthroughs by reducing barriers to care and fostering data-driven decision-making across the transplant continuum. University Health's adoption of AI and predictive analytics underscores how emerging technologies can revolutionize healthcare delivery and research, offering a model for digital innovation in clinical practice.

Investing in robust network infrastructure and optimizing data transfer protocols are essential steps toward accommodating the bandwidth needs of AI and predictive analytics. By doing so, HCOs can unlock the full potential of these technologies to drive innovation and improve patient outcomes.

Mayo Clinic has similarly invested in modern infrastructure to propel personalized medicine. To manage vast amounts of patient data, including genomics, imaging, and EHR information, they built a robust data lake, partnered to create a de-identified data platform for research, and employed high-performance computing for complex analyses.

This strategic investment has delivered measurable outcomes, including faster diagnoses, more precise treatment plans, and accelerated drug discovery. For example, Mayo Clinic's use of AI to analyze EKGs/ECGs has enabled the detection of subtle heart disease indicators that human clinicians might miss, directly improving patient outcomes. Their modernized infrastructure proves that advanced analytics and cloud computing can drive transformative innovations in personalized medicine and care delivery.

Future-Ready Cloud Strategies

Healthcare IT leaders have underscored the necessity of cloud solutions for acquisitions and expanding geographically diverse operations. While cost concerns remain a challenge —particularly as HCOs shift from capital to operational expenditures — strategic approaches like workload placement assessments and multi-cloud diversification can help maximize ROI.

Cloud-enabled innovation will play a key role in addressing emerging healthcare demands, ensuring that organizations remain agile, scalable, and capable of delivering care anywhere. This requires a robust and adaptable network infrastructure that can support the increasing demands of cloud-based applications and services.

Future-ready cloud strategies depend not only on the cloud platform itself but also on flexible and scalable connectivity to support seamless data flow and access to cloud-based resources.

The cloud-driven modernization of healthcare infrastructure has enabled greater scalability, operational efficiency, and real-time access to critical systems and data. These advancements support innovative care delivery models and streamline workflows, but they also create new security challenges. As healthcare becomes more decentralized — with patients, clinicians, and devices accessing systems from multiple locations — safeguarding sensitive data requires a shift from traditional perimeter defenses to identity-based security strategies.

3 Identity is the New Perimeter: Securing Access in a Decentralized Ecosystem

The adoption of mobile and remote technologies in healthcare has dissolved traditional network perimeters, making identity the cornerstone of modern security strategies. In a decentralized ecosystem, where patients, clinicians, and staff access data from multiple locations and devices, verifying and authorizing user identities is essential to protecting sensitive systems.

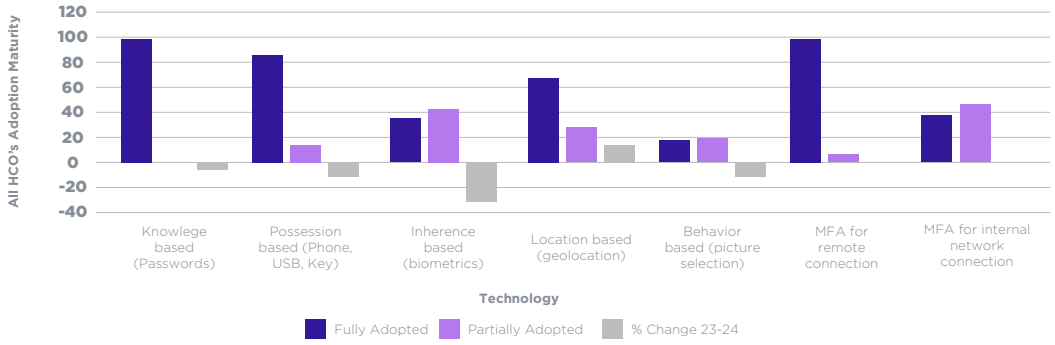
The 2024 DHMW survey underscores the growing adoption of identity-based security strategies to meet the challenges of decentralization.

High Adoption of Access Control and MFA

HCOs are prioritizing robust authentication measures. Access control policies and multi-factor authentication (MFA) are widely adopted, indicating a strong focus on verifying user identities before granting access to sensitive systems and data.

Security Authentication Technology

Adoption of technologies to authenticate/mange authorized users

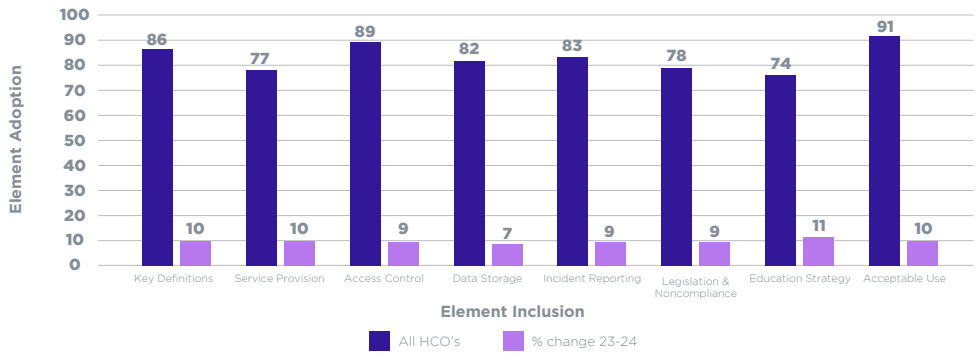


Enhanced BYOD Policies

Bring Your Own Device (BYOD) policies are becoming more comprehensive, now incorporating elements like acceptable use guidelines and access control measures. This trend reflects the growing need to secure employee-owned devices accessing organizational networks and data.

BYOD Policy Elements

Elements included in organizations' bring-your-own-device (BYOD) policy



Despite progress in identity-based security, challenges remain.

“Smaller healthcare providers often face significant challenges in implementing robust identity-based security measures.,” Laracuente noted. “Limited IT resources and the lack of dedicated security expertise can hinder their ability to protect sensitive data in an increasingly decentralized environment.”

As such, it can be challenging to implement and enforce robust training programs for staff, including education on the security considerations of using personal devices in care settings. This highlights the need for targeted training and awareness programs to ensure all stakeholders understand their role in safeguarding organizational data.

To enhance identity-based security in a decentralized healthcare ecosystem, organizations should consider the following best practices, increasingly considered crucial and essential for hyperconnected hospitals:

Identity Governance: Implement robust identity governance frameworks to manage user identities and access privileges effectively. This includes establishing clear procedures for provisioning, de-provisioning, and managing user roles and permissions.

Multi-Layered Security: Combine identity-based security with other security measures, such as network segmentation, data encryption, and endpoint security. A multi-layered approach provides comprehensive protection against a wide range of threats.

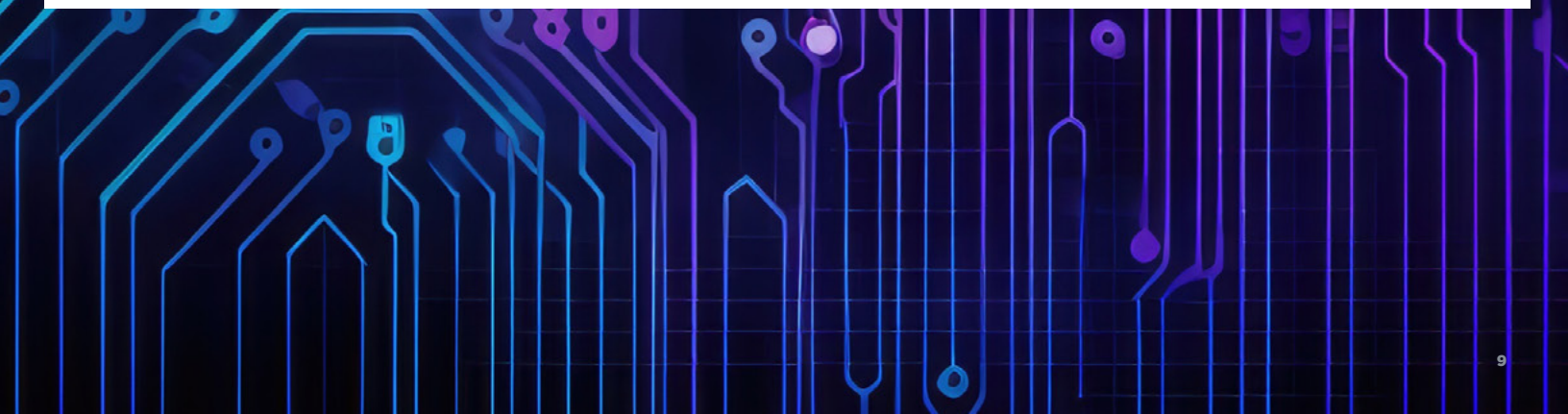
Zero-Trust Approach: Zero-trust security, including network access, represents a fundamental shift from traditional perimeter-based approaches. By assuming that no user or device can be trusted by default, organizations can significantly reduce vulnerabilities across their decentralized ecosystems. This approach requires strict verification and authorization for every access request, regardless of the user’s location or device.

Engage with Managed Network Service Providers: Smaller HCOs with limited IT resources and security expertise can benefit from partnering with managed network service providers. These providers can offer specialized knowledge, support, and solutions to enhance identity-based security and address the challenges of a decentralized environment.

Secure Access Service Edge (SASE): SASE combines networking and security functions in a unified cloud platform to streamline secure access management, especially in decentralized environments with diverse users and devices.
“SASE facilitates authentication at the network edge, adding a critical layer of security to connections between cloud and core resources without compromising network stability,” Craver explained. “This approach empowers our clients to realize the efficiency of modern, decentralized healthcare architect while maintaining robust security.”

By implementing these best practices, HCOs can strengthen their security posture and protect sensitive data in an increasingly decentralized environment.

As healthcare evolves toward decentralized care models, identity-based security is not just a priority — it is a necessity for ensuring trust, safety, and operational continuity.



4 Building Resilient and Flexible Infrastructure for Care Anywhere

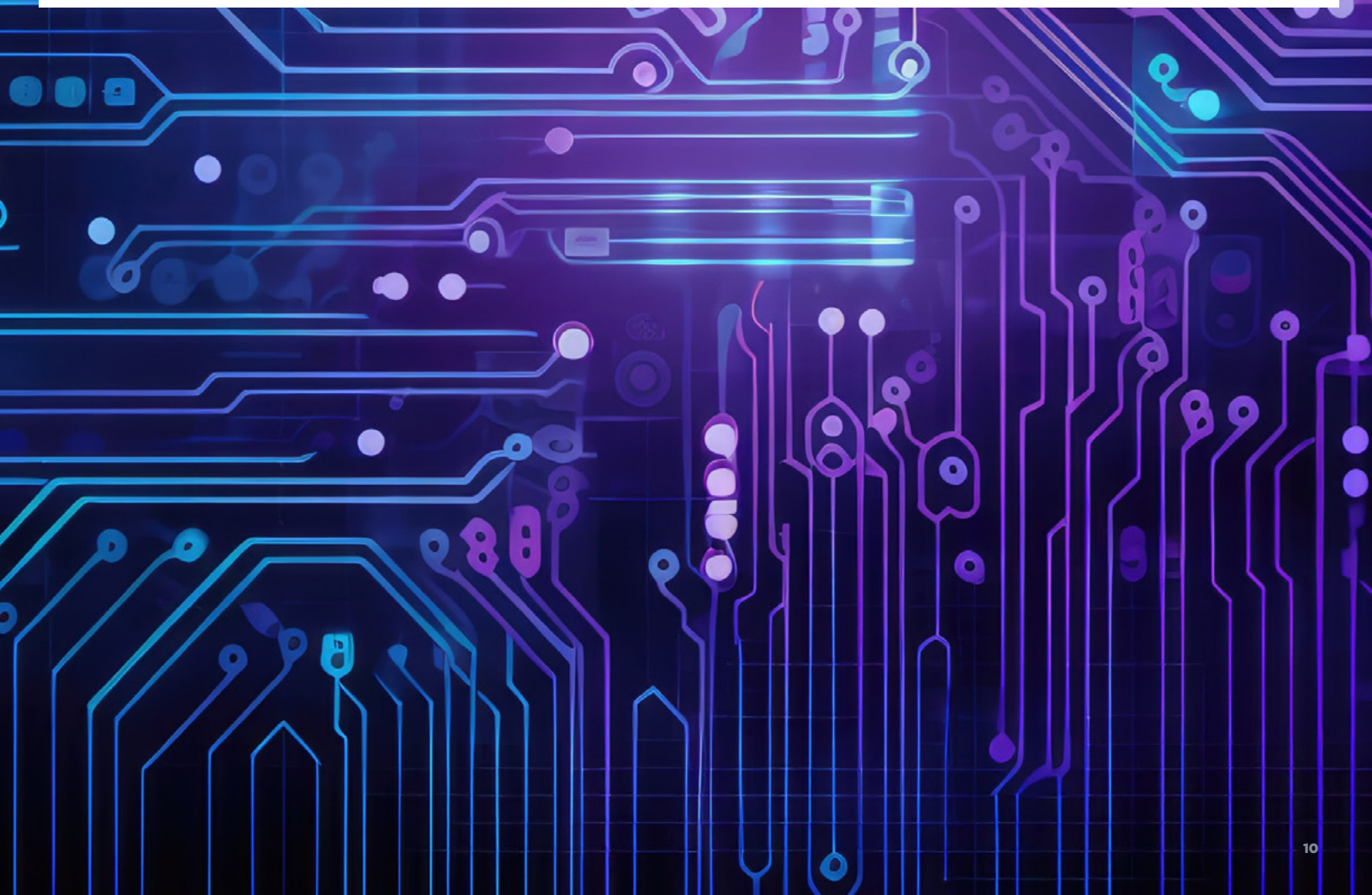
Ensuring long-term sustainability requires a future-ready infrastructure that combines governance, monitoring, and flexibility. Comprehensive governance frameworks provide visibility and control over complex systems, while monitoring tools ensure infrastructure resilience in the face of disruptions.

Emerging technologies such as AI and predictive analytics are critical for optimizing infrastructure, offering real-time insights that support proactive issue resolution and performance enhancements. Strategic partnerships with technology providers also play a vital role, enabling HCOs to scale innovation and address emerging demands efficiently.

"The challenge lies in finding a single partner that can meet the full range of requirements across different site types and geographies along with managed services that comprise a high performance, secure modern network that is especially critical for health systems with large or multi-region networks," Craver advised—noting Spectrum Business provides technology solutions to 90% of the largest U.S. health systems. "Utilizing multiple vendors across these complex environments can lead to uneven network performance, more trouble resolution complexity and higher management overhead. Choosing a single source provider capable of delivering high performance networking solutions in tandem with seamless service is the best path to overcoming these challenges."

Robust infrastructure underpins advancements in care delivery, cloud innovation, and security. The adoption of progressive delivery models is enabling healthcare services to be accessed when, where, and how consumers prefer, emphasizing convenience and responsiveness.

The 2024 DHMW survey underscores the critical role of infrastructure in digital health transformation. As such, HCOs must prioritize investments in resilient, secure, and scalable infrastructure to meet the demands of "delivery of care" anywhere and ensure sustainable success in an ever-evolving healthcare landscape.



About CHIME

The College of Healthcare Information Management Executives (CHIME) is an executive organization dedicated to serving chief information officers (CIOs), chief medical information officers (CMIOs), chief nursing information officers (CNIOs), chief innovation officers (CIOs), chief digital officers (CDOs), and other senior healthcare IT leaders. With more than 5,000 members in 58 countries plus 2 US territories and over 190 healthcare IT business partners and professional services firms, CHIME and its three associations provide a highly interactive, trusted environment enabling senior professional and industry leaders to collaborate, exchange best practices, address professional development needs, and advocate the effective use of information management to improve the health and care in the communities they serve. For more information, please visit **chimecentral.org**.

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SE-HC-RR010