COMMENTARY

The Missing Foundation: Why Digital Architecture Must Be Health Care's Next Priority

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American health care is undergoing revolutionary transformation in the digitization of data collection and related analytic and use processes. For example, the Health Information Technology for Economic and Clinical Health (HITECH) Act catalyzed near-universal electronic health record adoption (Blumenthal, 2011). Likewise, the 21st Century Cures Act established frameworks to combat information blocking (ONC, 2020). Furthermore, Fast Healthcare Interoperability Resources (FHIR) standards now enable data exchange through frameworks such as Substitutable Medical Applications and Reusable Technologies (SMART) on FHIR, Bulk FHIR, and the Trusted Exchange Framework and Common Agreement (TEFCA), resulting in millions of daily transactions (ONC, 2024). These developments enable standardized, scalable data exchange across health systems, including patient access to their own data. The authors agree that the next phase of developments will require a cohesive digital and data architecture that enables a learning health system in which data, evidence, and clinical care are continuously connected.

A cohesive digital and data architecture is foundational to a learning health system. A learning health system is one in which science, informatics, incentives, and culture are aligned to enable continuous improvement, with knowledge generated through clinical care and rapidly reintegrated into practice. This requires more than the ability to exchange data. It depends on reliable data flows, shared standards, and systems designed for feedback, adaptation, and trust in real time. Without an underlying architecture that supports these functions, insights may remain siloed, learning cycles may slow, and opportunities to improve outcomes, equity, and efficiency may be lost. With it, health care can move toward a system in which evidence generation and care delivery are seamlessly connected.

What Architecture Provides

Flexible architecture that supports interoperability and the sharing of reliable, verifiable data is an essential prerequisite for the nation's health and health care goals. Other industries demonstrate this advantage. For example, home construction

organizes around foundations, framing, plumbing, electrical systems, and heating, ventilation, and air conditioning—each is a subindustry with standards enabling market-wide innovation. Likewise, the architecture of global telecommunications enables seamless worldwide connectivity while supporting continuous evolution. Furthermore, the architecture of financial systems allows for credit cards to work anywhere while maintaining security and oversight.

The authors share the perspective that health care currently lacks this maturity. Most systems deploy customized infrastructures with few common patterns, creating barriers to innovation, coordination complexity, misaligned incentives, and leadership gaps. A robust architecture would establish common protocols, define modularity boundaries, give purpose to interoperability standards, and enable data liquidity, artificial intelligence (AI) readiness, and user-centered design.

As a starting point for discussion, *Figure 1* presents a proposed health digital and data architecture. Structurally, this proposed architecture takes the form of a "technology stack."

The AI Imperative

Exploring the potential of AI to improve health, medicine, and biomedical sciences has rendered obvious the structural flaws in current digital architecture. The authors believe that AI promises to revolutionize clinical decision support, drug discovery, diagnostics, precision medicine, and precision public health. Early results are striking: AI-enhanced electrocardiograms have detected atrial fibrillation with 83 percent accuracy in asymptomatic patients; machine learning has

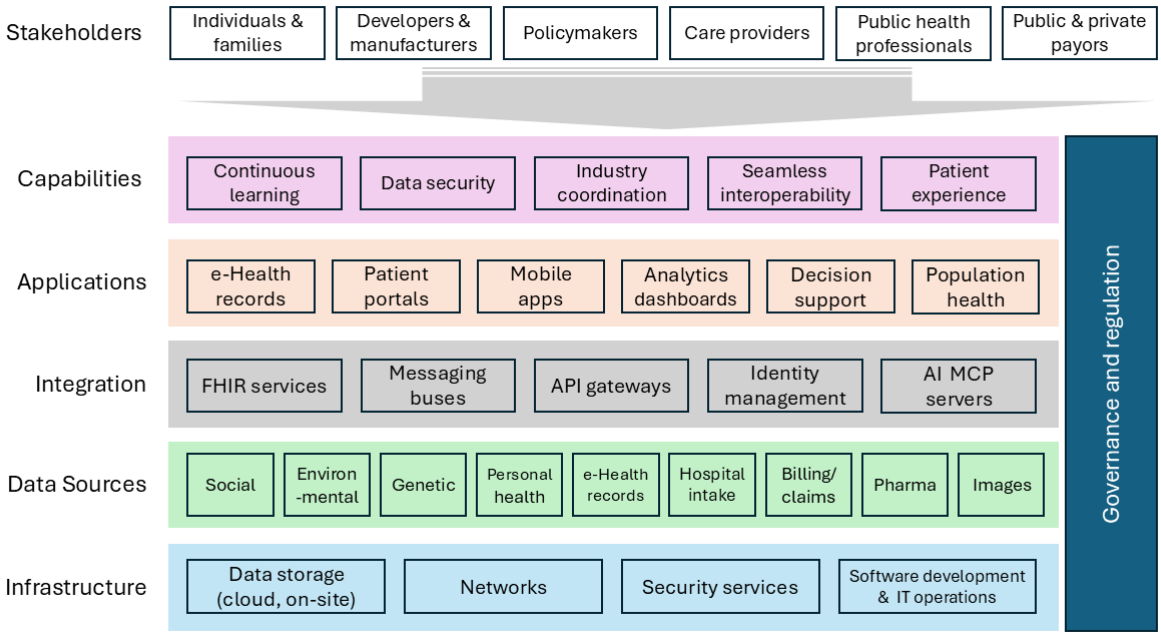

FIGURE 1 | Health Digital and Data Architecture Conceptual Framework

SOURCE: Adapted from Abernethy, A., N. Afsar, B. Anderson, W. Barfield, M. Bharel, J. Brown, P. Embí, A. Eschenlauer, W. Gordon, S. Gregurick, B. James, A. Jena, P. Lee, T. Maddox, K. Mandl, R. Parikh, L. Petersen-Lukenda, T. Sarich, A. Shaikh, P. Speyer, and K. Yale. 2026. Toward a national health digital and data architecture: Laying the foundation for digital transformation. *NAM Perspectives*. Discussion Paper, National Academy of Medicine, Washington, DC. https://doi.org/10.31478/202603b.

NOTE: FHIR = Fast Healthcare Interoperability Resources; API = application programming interface; MCP = model context protocol.

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identified heart failure readmissions earlier; and deep learning has achieved 95 percent accuracy in diabetic retinopathy screening (Attia et al., 2019; Kessler et al., 2023; Rajesh et al., 2023).

However, AI systems require more than data availability. They also need organization, quality, consistency, sharing protocols, and computability across the entire ecosystem. Today's fragmented ecosystem severely limits AI's potential. For example, hospitals produce 50 petabytes of data annually, yet only 3 percent of this data are used for analytics or care coordination (World Economic Forum, 2019; Moore and Guichot, 2024). AI models trained on one system may fail when deployed in another. Without coherent architecture, the industry risks the development of an AI ecosystem that is as fragmented as the current infrastructure, limiting innovation and perpetuating disparities.

The Path Forward

The authors agree that converging forces demand immediate action. This action requires the convening of stakeholders to develop a consensus on architectural principles; focused governance that prioritizes foundational interoperability requirements; strategic investment in national infrastructure; workforce development; patient empowerment over their health information; and accountability mechanisms for AI safety and interoperability. The groundwork for this shift is already being laid through efforts such as the Centers for Medicare & Medicaid Services (CMS) Health Technology Ecosystem initiative and the associated group of aligned networks (CMS, 2026). Aligning a mature, public and private, fully interoperable, and securely governed national data architecture with the CMS initiatives to modernize and strengthen the digital health ecosystem would create powerful synergies across thousands of organizations nationwide.

A focused set of levers can drive alignment and accelerate progress toward a national digital and data architecture (Abernethy et al., 2026). These levers promote regulatory simplification and alignment across federal agencies, prioritize a small set of foundational interoperability capabilities, require stronger accountability for data sharing and performance, and empower patients to access and direct the use of their data. They also entail coordinated public and private investment in infrastructure, workforce development, and digital literacy, alongside responsible integration of AI into clinical workflows with continuous monitoring for safety and effectiveness. Taken together, these levers reflect a shift from fragmented, organization-specific solutions toward a more coherent and scalable ecosystem. They provide both a practical roadmap for action and a clear invitation to engage more deeply with the full set of priority actions (Abernethy et al., 2026).

Health care stands at a crossroads. As the system builds on substantial gains in interoperability, the circumstances are now in place to address fragmentation through a coherent and interoperable digital architecture. A broadly engaged convening of stakeholders across industry, academia, and government will be essential to accelerate progress. Without architectural coherence, the digital health ecosystem will become more complex and fragmented even as it advances. With it, health care can realize a learning health system that continuously improves, reduces waste, advances equity, and enables the effective use of AI to transform care. The foundation has been laid. The opportunity is here. The question is whether all stakeholders will achieve the collective action required to seize it.

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Disclaimer

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About the Commission on Investment Imperatives for a Healthy Nation

For decades, the United States has invested more in health care than any other nation. US medical practitioners are world class. Scientists are making breakthrough discoveries, and our culture of innovation is admired worldwide. Yet so many Americans experience care as confusing, costly, and disconnected from their health needs, goals, and priorities, making the word "broken" an all-too-common description of the health care system. Too often, care is organized around services and transactions rather than the outcomes people value most: living the life they want, managing illness without it defining them, and staying independent and safe as they age. That gap raises a central question: how can the system evolve to better support health as people experience it every day?

The National Academy of Medicine Commission on Investment Imperatives for a Healthy Nation was established to reimagine a US health care system that puts people first. As part of its work, the Commission will publish papers on individual and community health goals, health financing, digital and data architecture, and private equity investments, describing their vision for a new health system, the priorities that must be considered, and the actions that can be taken to make their vision a reality.

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