RESEARCH INSIGHTS

From Crisis to Transformation:

Leveraging Telemedicine to Drive Healthcare System Change in an Age of Polycrisis

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Abstract

This study examines telemedicine's rise during the COVID-19 pandemic. Drawing upon literature from diverse healthcare settings, we document how healthcare organizations adapted their delivery systems - including information technology, regulatory, social, and economic components - to enable rapid telemedicine adoption. Through analysis of implementation experiences across academic medical centers, specialty departments, rare disease networks, and resource-constrained environments, we describe changes organizations made to maintain care delivery during crisis conditions. Our findings provide insights into how healthcare delivery systems adapted during the pandemic while highlighting practical insights for healthcare leaders managing complex organizational change.

Introduction

Healthcare organizations faced unprecedented challenges during the COVID-19 pandemic, from infection risks and personnel shortages to disrupted supply chains and widening health disparities (Lawrence et al., 2024; Wang & Alexander, 2021; Tran et al., 2020). The scale of disruption was extraordinary: the AHRQ's HUCP[1] data revealed that hospital capacity reached critical levels by December 2020, with many hospitals in large metropolitan areas seeing ICU occupancy rise from a baseline of 63.7% to over 100% during COVID-19 surges (Meille et al., 2023). Healthcare workforce data from the US Bureau of Labor Statistics Quarterly Census of Employment and Wages showed a 5.2% decline in healthcare employment in Q2 2020 compared to 2019 pre-pandemic levels, with the impact varying significantly by sector—dental offices experienced a 10.0% decline, skilled nursing facilities 8.4%, physician offices 4.6%, and hospitals 2.5% (Cantor et al., 2022).

The pandemic's impact on healthcare delivery exemplifies what researchers call a "global polycrisis," where multiple crises become causally entangled in ways that amplify their effects (Lawrence et al., 2024). For example, staff shortages directly impacted hospitals' ability to maintain standard care protocols, while supply chain disruptions forced changes in clinical procedures. These challenges were further complicated by pre-existing system vulnerabilities: chronic underfunding left many facilities unprepared for surging demands and human-viral interactions—arising from factors like urbanization, global travel, and wet markets where animals are sold and slaughtered near humans (Lawrence et al., 2024). The intersection of these factors created cascading effects that exceeded the impact any single crisis would have produced in isolation (Lawrence et al., 2024).

Among the adaptive responses to the polycrisis, the rapid adoption of telemedicine—medical care provided remotely via electronic communication (Wechsler, 2015)—emerged as one of the most significant transformations in contemporary healthcare delivery practices. Before the pandemic, telemedicine was an underutilized tool in most healthcare settings (Tran et al., 2020; Grossman et al., 2020; Contreras et al., 2020). COVID-19 rapidly accelerated its adoption as healthcare systems were forced to limit in-person encounters. A Department of Health and Human Services (HHS) report showed telehealth adoption had surged to 43.5% of all Medicare primary care visits, compared to just 0.1% in February 2020 (Bosworth et al., 2020).

[1] The Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUPh) is the US's most comprehensive source of hospital care data https://www.ahrq.gov/data/hcup/index.html

The transformation in telemedicine adoption during the pandemic demonstrates how crises can serve as powerful catalysts for overcoming institutional inertia. While technological capabilities for telemedicine existed before COVID-19, implementation was stalled by entrenched resistance from various stakeholders. The polycrisis conditions created by the pandemic temporarily suspended this resistance, enabling transformative experiences that might have been impossible under normal circumstances. This phenomenon—where crises spur tremendous growth and opportunity by disrupting established patterns—offers valuable insights for healthcare leaders seeking to implement system-wide change.

This dramatic shift required overcoming longstanding systemic obstacles, including cost and reimbursement policies, licensure restrictions, equipment issues, and gaps in broadband access (Turner et al., 2020). These obstacles suggest deeply entrenched institutional resistance to change fueled by vested interests, regulatory inertia, and misaligned economic incentives rather than mere technical challenges (Leslie & Pasmore, 2025).

The polycrisis context demands not just technological solutions but fundamentally new approaches to understanding cross-organizational healthcare collaboration during complex emergencies. Two complementary frameworks help explain this rapid transformation in healthcare delivery practices despite traditional social and institutional resistance. First, as Leslie and Pasmore (2025) emphasize, addressing interconnected crises requires overcoming "barriers to collective action" that typically prevent effective partnerships between and among stakeholders. Second, systems thinking provides a framework for analyzing how healthcare organizations respond to complex challenges that simultaneously affect multiple interconnected components (Thompson et al., 2016). While healthcare systems typically resist change, the extreme pressures of the pandemic temporarily disrupted established patterns, that enabled healthcare leaders and organizations to more readily overcome barriers to collective action and adopt systems thinking approaches. This shift in perspective facilitated the rapid adoption of telemedicine that would have perhaps faced significant resistance under normal circumstances. This study examines how the pandemic's disruption of traditional healthcare practices accelerated both the adoption and transformation of telemedicine services, while also exposing the underlying barriers that had to be addressed to ensure lasting system-wide change. We apply a systems-thinking approach to analyze how different components of the healthcare system adapted during crisis conditions, and to understand what these adaptations reveal about the potential for sustained transformation in healthcare delivery.

Research Objectives

This study examines telemedicine implementation during the COVID-19 pandemic through a descriptive analysis of scholarly literature.[2] Specifically, we

1. document how healthcare organizations adapted telemedicine across different settings,
2. describe changes observed in key healthcare delivery systems, and
3. synthesize reported implementation experiences to inform future healthcare delivery adaptation.

Through this study, we aim to contribute to both a scholarly understanding of healthcare system transformation during polycrisis and practical knowledge for healthcare leaders navigating complex systems change, aligning with recent frameworks for understanding organizational adaptation during interconnected crises (Leslie & Pasmore, 2025; Leslie & Simmons, 2024).

Systems Objectives

Understanding the complex challenges posed by the COVID-19 pandemic requires a systems-thinking approach, which examines the interconnected components of organizational and societal systems rather than just studying isolated elements (Kast & Rosenzweig, 1972). This perspective has gained significant traction in organizational research, as evidenced by Dinh et al. (2014) identifying 110 articles applying systems-based approaches in major leadership journals.

The value of systems thinking becomes particularly evident when confronting complex, multi-faceted issues that involve multiple stakeholders and sectors and are characterized by high degrees of uncertainty, ambiguity, and interconnectedness (Klag & Langley, 2023; Leslie & Simmons, 2024). Traditional, linear problem-solving approaches are often inadequate for addressing these challenges, as they fail to account for the dynamic interactions and unintended consequences that can emerge from interventions in what are already complex systems (Meadows, 1999).

The COVID-19 pandemic induced polycrisis exemplifies this complexity, as Klag and Langley (2023) observe: it [COVID-19 pandemic] "overflows from the confines of the public health system to both amplify and interact with a wide range of other societal issues and problems, including economic prosperity, global supply chains, access to healthcare, racial inequity, and poverty" (p. 38).

Prior to the pandemic, systemic barriers—such as ideological resistance to change, misaligned incentives, and regulatory fragmentation—often prevented the adoption of innovative solutions (Leslie & Pasmore, 2025). Reimbursement policies that favored in-person visits, licensure restrictions that limited cross-state practice, and technological limitations all contributed to the slow uptake of virtual care (Lee et al., 2020). However, during the pandemic, the urgency of the situation temporarily lowered many of these barriers, creating a window of opportunity for the creative expansion of telemedicine.

[2] This study focuses specifically on the use of telemedicine during the COVID-19 pandemic and does not evaluate its applicability across all areas of medical care.

Methodology

Our research methodology combines focused analysis of peer-reviewed literature with supplemental healthcare data to provide depth and breadth in understanding telemedicine transformation during COVID-19.

Literature Review

We performed multiple steps to investigate research related to polycrisis and telemedicine. In November 2024, searching in the Web of Science (WOS) database for the term "polycrisis" yielded 151 results, and the term "telemedicine" yielded 45,026 results. Of note, 130 of the 151 polycrisis-related documents and 22,488 of the 45,026 telemedicine-related documents were published in 2020 or later. So, although the body of research on polycrisis is relatively small, the simultaneous growth of these areas of research demonstrates the influential role that the COVID-19 pandemic has played in catalyzing their inquiry. To investigate the intersection of these two fields, we then performed the search, "polycrisis" AND "telemedicine." This search yielded zero results. Thus, despite both fields' concurrent growth after the onset of COVID-19, to our knowledge, there has yet to be a single publication explicitly considering polycrisis and telemedicine together. Moreover, the lack of research on this intersection further emphasizes the novelty of our current study's focus.

We then conducted subsequent searches to identify whether there might be other adjacent fields defined by terms that are either synonymous or related to polycrisis within which telemedicine studies may exist. Based on the observation made with COVID-19 spurring research in both areas, we performed the search "COVID-19" and "telemedicine." The COVID-19 pandemic represents a quintessential example of a polycrisis, triggering simultaneous health, economic, social, and political crises with cascading effects. This search yielded 9,756 results. This result was promising because it suggests that there has likely been research performed that can support our current study of telemedicine within polycrisis. However, a cursory analysis of these 9,756 documents revealed that our search terms still needed further refinement.

To home in on research related to telemedicine and COVID-19 that may have also been related to polycrisis, we added several search terms to the previous search that capture qualities or features of polycrisis. Specifically, to look deeper within the 9,756 documents to find any that may be at least somewhat related to polycrisis, we performed the following search with systems-based thinking: "COVID-19" AND "telemedicine," AND "('Ripple effect' OR 'cascading impact' OR 'system effect' OR 'interconnected' OR 'spillover effect' OR 'network effect' OR 'system dynamic')." This final search yielded 9 documents. Next, we offer a thorough examination of this document sample.

Nine papers on telemedicine implementation during COVID-19 were reviewed. These papers spanned multiple healthcare contexts included studies from diverse healthcare settings: academic medical centers (Contreras et al., 2020), neurology departments (Grossman et al., 2020), rare inherited metabolic disease networks (Lampe et al., 2020), cancer care teams (Prades et al., 2022), ophthalmology practices (Tan et al., 2022), and resource-constrained environments (Tran et al., 2020). To strengthen our review, we incorporated supplemental data from authoritative healthcare organizations and regulatory bodies, including the Department of Health and Human Services (HHS), Agency for Healthcare Research and Quality (AHRQ), US Bureau of Labor Statistics Quarterly Census of Employment and Wages, Centers for Disease Control and Prevention (CDC), and US National Center for Health Statistics. It is important to acknowledge that our data sources are predominantly from the United States healthcare system. Despite extensive efforts to locate comparable international statistics, particularly quantitative data on telemedicine adoption rates, reimbursement changes, and implementation metrics from non-US healthcare systems, such data proved near-impossible to obtain. While our literature review includes some European examples (e.g., the MetabERN rare disease network spanning 23 EU Member States), the statistical evidence supporting our analysis draws heavily from US sources.

Analyses

Our analytical approach proceeded in two stages. First, we identified common patterns of system change across healthcare settings, such as how organizations modified their information flows and clinical protocols to accommodate telemedicine. Second, we categorized these patterns into five fundamental systems – information technology, regulatory, social, and economic – that emerged as key transformation domains across all healthcare contexts.

Results

Our analysis revealed substantial transformations across fundamental systems during the COVID-19 pandemic. Information technology systems underwent significant reconfigurations to support virtual care delivery, while regulatory frameworks rapidly adjusted to accommodate new care modalities. The social system demonstrated remarkable flexibility in adapting patient-provider interactions, and economic structures evolved to ensure telemedicine's financial viability. Below, we detail the specific adaptations observed within each system and their implications for healthcare delivery transformation.

1. Information Technology System

Healthcare organizations rely on an integrated information technology infrastructure that enables seamless virtual care delivery. The system consists of three essential components (Table 1):

INFORMATION TECHNOLOGY SYSTEM COMPONENTS AND FUNCTIONS

Component	Function
High-speed internet	Ensures reliable video connections.
Access to necessary devices	Enables both providers and patients to engage in virtual care (computers, tablets, smartphones).
Technical interoperability	Facilitates smooth communication between different healthcare platforms and systems.

TABLE 1

Key Information Technology System Adaptations During COVID-19

1. Specialized Virtual Examination Protocols: Neurology departments developed remote patient assessments for detailed neurological evaluations using advanced digital tools (Grossman et al., 2020).
2. Cross-Border Collaboration Standards: European rare disease networks, such as MetabERN, connected 77 healthcare providers across 23 EU Member States, addressing confidentiality and interoperability challenges (Lampe et al., 2020).
3. Specialty-Specific Virtual Care Protocols: Detailed examination and documentation guidelines were integrated into Electronic Medical Record (EMR) systems for multiple medical specialties (Grossman et al., 2020; Prades et al., 2022).
4. Enhanced EMR Integration for Virtual Consultations: Mobile apps like Haiku and Canto allowed secure patient data access during video visits (Grossman et al., 2020).

Despite improved connectivity, issues such as interoperability, data privacy regulations, and inconsistent exchange processes remained widespread challenges in healthcare organizations (Prades et al., 2022). These technical barriers continue to hinder the seamless integration of telehealth platforms with existing EHR systems.

2. Regulatory System

The regulatory system consists of laws, policies, and compliance frameworks that ensure safe and equitable healthcare. The COVID-19 pandemic led to rapid regulatory changes to support telemedicine, with three key modifications having a significant impact (Table 2, following page).

KEY REGULATORY CHANGES AND THEIR IMPACT ON TELEMEDICINE

Regulatory Change	Impact
US HIPPA Flexibility	Allowed the use of non-compliant platforms to expedite telemedicine adoption (Contreras et al., 2020).
Medicare Reimbursement Parity	Established equal payment rates for virtual and in-person visits (Tan et al., 2022).
Interstate Licensure Flexibility	Enabled providers to offer care across state borders (Wang & Alexander, 2021).

TABLE 2

Regulatory System Adaptations

1. **Temporary US HIPPA Flexibilities:** Government agencies relaxed enforcement of HIPPA regulations to enable broader telemedicine adoption (Contreras et al., 2020; Tan et al., 2022; Wang & Alexander, 2021).
2. **Reimbursement Parity for Telemedicine:** US Medicare and private insurers introduced payment structures to support and encourage virtual care (Tan et al., 2022).
3. **Licensure Adaptations:** US State medical boards allowed providers to practice across geographic boundaries, improving patient access (Contreras et al., 2020; Tan et al., 2022; Wang & Alexander, 2021).
4. **Specialty Virtual Care Protocols:** Ophthalmology, neurology, and oncology teams developed digital systems and virtual assessment standards (Tan et al., 2022; Grossman et al., 2020; Prades et al., 2022).
5. **Telemedicine Innovations in Cancer Care:** Virtual platforms enabled specialist care consultations and multidisciplinary collaboration while minimizing transmission risks (Prades et al., 2022).

The regulatory system underwent significant shifts and changes, with governments easing telehealth restrictions and insurers adjusting their reimbursement policies. These changes illustrate a real-time application of the Change Formula (D × V × F > R) (Dannemiller & Jacobs, 1992), which Leslie & Pasmore (2025) apply to polycrisis contexts. The extreme dissatisfaction (D) created by the pandemic, combined with a clear vision (V) for virtual care expansion and concrete first steps (F) in the form of temporary policy adjustments, allowed telemedicine to overcome long-standing resistance (R). However, temporary changes do not always lead to permanent reform, and many of these regulatory flexibilities are now being reconsidered, raising concerns about the sustainability of these adaptations.

Social System

The social system influences how telemedicine is accepted, shaped by cultural norms, patient-provider relationships, and trust. The pandemic fundamentally reshaped patient and provider interactions, with four major social changes affecting healthcare delivery (Table 3).

SOCIAL SYSTEM CHANGES AND THEIR EFFECTS ON HEALTHCARE DELIVERY

Social Change	Effect
New Virtual Workflows	Telephone triage replaced walk-ins; reducing the risks of in-person exposure (Grossman et al., 2020).
Virtual Exam Procedures	Appointment-based video and phone consultations became standard (Otto & van der Wardt, 2024).
Patient Tech Adoption Variability	Some patients adapted quickly, while others struggled with digital tools (Otto & van der Wardt, 2024).
Community Telemedicine Expansion	Leaders coordinated telehealth access in low-resource settings (Tran et al., 2020).

TABLE 3

Key Social System Adaptations

1. **New Virtual Workflows:** Walk-ins were replaced with structured telephone and digital appointment scheduling (Grossman et al., 2020), improving access efficiency and reducing in-person exposure risks
2. **Virtual Examination Procedures:** Healthcare providers established standardized guidelines for video-based consultations (Otto & van der Wardt, 2024), enabling consistent quality of care across virtual platforms.
3. **Patient Adaptation to Digital Tools:** While some patients were comfortable with phone and video consultations, others showed differing levels of comfort with digital healthcare technologies (Otto & van der Wardt, 2024), creating disparities in healthcare access and necessitating tailored support strategies to ensure equitable care delivery.
4. **Community-led Implementation Efforts:** Government and health organizations collaborated to establish telemedicine expansion in resource-limited areas (Tran et al., 2020).
5. **High Virtual Care Adoption in Rare Disease Centers:** Nearly 90% of centers successfully transitioned to video or phone consultations (Lampe et al., 2020).
6. **Public Health Coordination by Local Organizations:** Communities mobilized resources for pandemic responses, particularly in underserved areas (Tran et al., 2020).

The social system also rapidly changed, as providers and patients adapted to virtual care. Initial skepticism—rooted in belief barriers such as distrust in digital healthcare and overreliance on traditional medical practices—was largely overridden by necessity. However, the uneven adoption of telemedicine among different patient populations highlights the persistence of confidence barriers, particularly among patients in low-resource settings who struggled with digital access and literacy. For instance, an analysis of CDC data from 2021 revealed that patients in rural areas had a telemedicine utilization rate of 27.5% compared to 40.3% in large central metropolitan areas, representing a significant urban-rural divide. Meanwhile, telemedicine use varied by age, with college-educated patients having a utilization rate of 43.2% compared to just 28.7% among those with less than a high school diploma, highlighting substantial educational disparities in virtual healthcare access (Lucas & Wang, 2024). These disparities underscore the digital access and literacy challenges faced by certain populations.

3. Economic System

The economic system determines the financial viability of telemedicine, including reimbursement models, funding structures, and cost policies. Several economic factors played crucial roles in enabling telemedicine expansion during the pandemic (Table 4).

ECONOMIC FACTORS AND THEIR IMPACT ON TELEMEDICINE IMPLEMENTATION

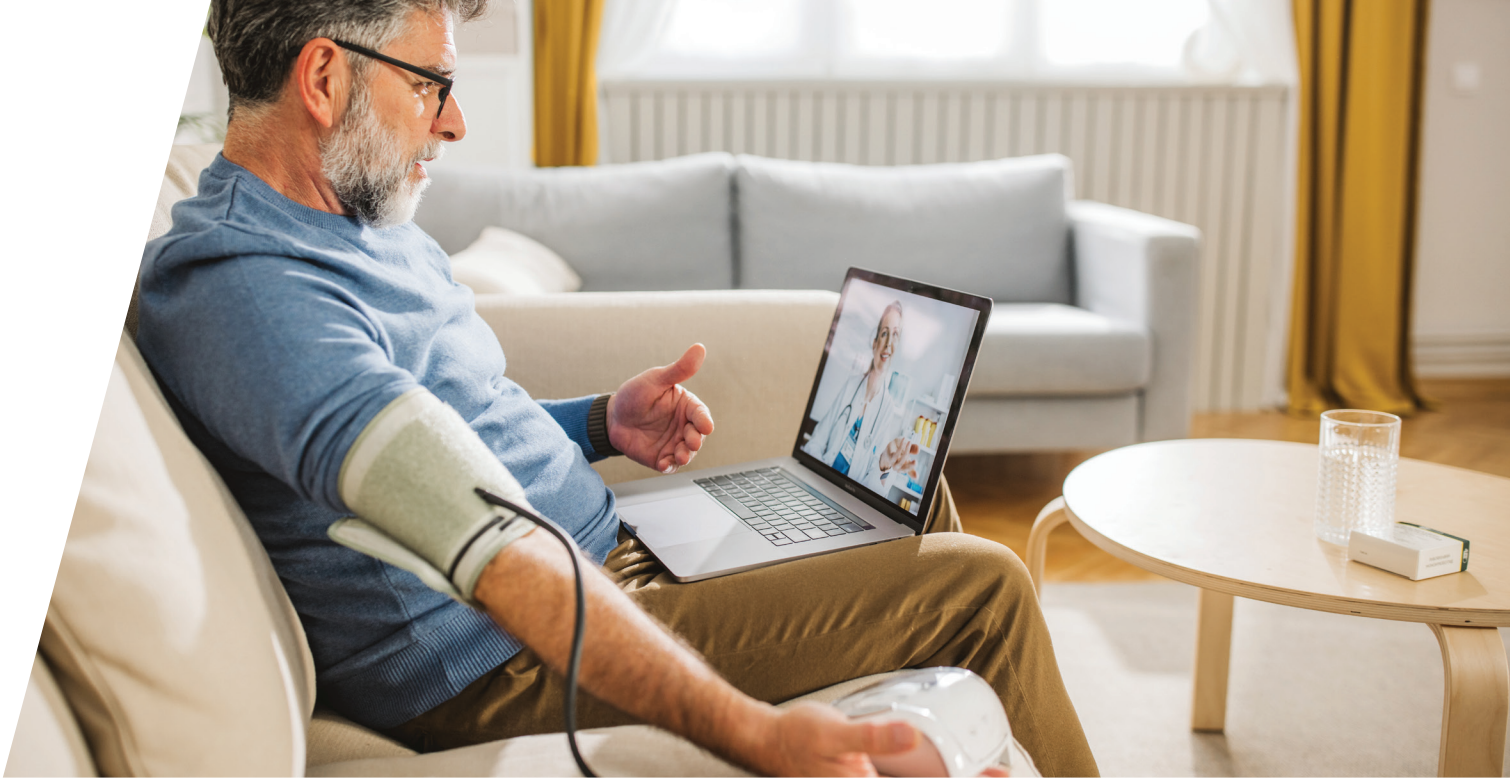
Economic Factor	Impact
Billing Code Revisions	UA Medicare introduced new telemedicine billing codes to ensure financial viability (Contreras et al., 2020).
Government Telehealth Funding	The US FCC's COVID-19 Telehealth Program allocated $200 million for infrastructure (Contreras et al., 2020).
Medicare Advantage Expansion	Removed site restrictions, saving an estimated $557 million over 10 years (Contreras et al., 2020).
Rural Telehealth Support	The US Rural Health Care Program expanded broadband access for remote patients (Contreras et al., 2020).

TABLE 4

Key Economic Systems Adaptations

1. **New Billing Codes for Virtual Care:** Medicare and insurers updated reimbursement frameworks to support telemedicine (Contreras et al., 2020).
2. **Government Funding for Digital Infrastructure:** The US FCC's COVID-19 Telehealth Program allocated $200 million for hardware and broadband expansion (Contreras et al., 2020).
3. **Staff Training Investment:** Healthcare organizations trained healthcare providers, schedulers, and billing specialists to support telemedicine workflows (Contreras et al., 2020).
4. **Medicare Advantage Expansion:** The US 2018 Bipartisan Budget Act removed geographical restrictions, saving enrollees an estimated $557 million over 10 years by reducing travel costs for patients (Contreras et al., 2020).
5. **Connected Care Pilot Program:** A $100 million US initiative connected healthcare providers with underserved patients and veterans through broadband-enabled telehealth (Contreras et al., 2020).
6. **US HIPPA Cost Flexibilities:** Reduced compliance enforcement allowed providers to use cost-effective telehealth platforms (Contreras et al., 2020).
7. **Expansion of Rural Telemedicine Programs:** The US FCC's Rural Health Care Program improved broadband access for geographically remote patients (Contreras et al., 2020).

The economic system saw major shifts in telemedicine funding, with the US government allocating $200 million through the FCC's COVID-19 Telehealth Program and insurers introducing new billing codes. However, vested interests often seek to restore pre-crisis financial structures. These early indications suggest that reimbursement policies and funding may be rolled back. Without sustained commitment, these economic adaptations may prove temporary rather than permanent structural changes to healthcare financing.



System Interactions

Our literature review highlights the interconnected nature of telemedicine implementation, demonstrating how changes in information technology, regulatory frameworks, social dynamics, and economic structures influenced one another. Data from the US National Center for Health Statistics underscore these interdependencies: healthcare facilities with electronic health records had up to 138% higher telemedicine adoption rates, while office-based physicians experienced a 403% increase in telemedicine utilization following expanded reimbursement policies (Peters et al., 2024). These findings suggest that telemedicine's success was not driven by isolated policy or technological changes alone but by a synchronized response across multiple systems.

One clear example of these interconnections is the impact of regulatory policy changes on healthcare system adaptations. When regulatory agencies temporarily modified HIPPA requirements to facilitate telemedicine expansion, healthcare organizations responded by making simultaneous adjustments across multiple domains. Many healthcare organizations developed new payment structures to ensure virtual consultations were financially viable, while healthcare systems invested in the necessary infrastructure to support remote care. Information systems were also modified to enable secure and efficient virtual visits, integrating electronic medical records with telemedicine platforms. Additionally, clinical workflows evolved to accommodate remote patient interactions, requiring providers to adopt new protocols for virtual examinations, diagnosis, and follow-up care. These concurrent changes highlight how a single regulatory shift had cascading effects across economic, technological, and clinical systems, ultimately shaping the way healthcare was delivered.

A similar pattern of multi-system adaptation was observed in cross-border healthcare delivery, particularly within European rare disease networks. To facilitate telemedicine for patients requiring specialized care across different countries, healthcare institutions developed technical standards that ensured seamless virtual consultations and data exchange. These efforts were accompanied by adaptations in reimbursement policies, allowing providers to receive compensation for telemedicine services across national boundaries. Additionally, new information-sharing protocols were established to maintain the security and privacy of patient data while enabling collaboration between healthcare providers in different regions. These changes not only expanded access to specialized care but also strengthened engagement between providers and patients, demonstrating how coordinated system modifications can enhance telemedicine's effectiveness and sustainability.

These examples illustrate how systemic adaptation occurred across different healthcare settings. However, while the rapid synchronization of changes enabled telemedicine's success during the crisis, the long-term sustainability of these transformations remains uncertain.

Discussion and Implications for Practice

The analysis of telemedicine implementation during the COVID-19 pandemic reveals four critical insights about healthcare system transformation. First, successful telemedicine adoption required synchronized changes across multiple systems. As Leslie & Pasmore (2025) emphasize, systemic change is most effective when multiple barriers—technological, regulatory, social, and economic—are addressed simultaneously. Telemedicine's success during COVID-19 was not just a technological shift but a coordinated effort requiring regulatory flexibility, financial incentives, and cultural acceptance.

Second, polycrisis-driven change does not guarantee long-term transformation. While telemedicine overcame entrenched barriers during the pandemic, systemic inertia often pulls organizations back to pre-crisis norms. The rollback of emergency telehealth policies and reimbursement structures suggests that, without intentional leadership and policy interventions, telemedicine's gains may be temporary and fleeting.

Third, the pandemic exposed both the possibilities and limitations of crisis-driven innovation. Necessity forced temporary alignment among stakeholders, but lasting systemic change requires more than short-term solutions. It demands sustained leadership, continuous learning, and small-scale experimentation that builds long-term momentum (Leslie & Pasmore, 2025).

The fourth insight centers on the unprecedented collaboration that enabled telemedicine's rapid adoption. Increased collaboration is one of four essential components for addressing systemic challenges, alongside technological capability, sustained engagement, and scaled resources (Leslie & Pasmore, 2025). Our analysis confirms that expanded telemedicine implementation exemplified all four components. Technological capability emerged as healthcare organizations rapidly deployed existing technologies and developed innovative virtual care protocols. Increased collaboration brought together previously disconnected stakeholders—including healthcare providers, regulators, insurers, and technology companies—who aligned around the shared objective of maintaining care delivery. This collaborative approach temporarily overcame what the researchers describe as deeply entrenched vested interests and persistent disagreement on solutions (e.g. Leslie & Pasmore, 2025). Healthcare demonstrated sustained engagement, maintaining their commitment to telemedicine implementation despite significant technical challenges and workflow disruptions. Strategic financial investments and timely regulatory changes enabled the rapid and extensive scaling of telemedicine infrastructure, addressing resource constraints that had previously hindered innovation.

The Direction, Alignment, and Commitment (DAC) framework (Drath, McCauley, Palus, VanVelsor, O'Connor & McGuire, 2008) provides a valuable lens for understanding these dynamics. DAC is the result of effective leadership and a precursor to action in organizations and systems. In systems crises, DAC demands particular attention from leaders who hope to catalyze diverse parties, often competing or conflicting interests, to join in collective action. For instance, the integration of telemedicine within European rare disease networks illustrates how the pandemic facilitated unprecedented collaboration, connecting 77 healthcare providers across 23 EU Member States—a level of cross-border cooperation that had previously been constrained by institutional and regulatory barriers (Lampe et al., 2020).

These insights are particularly relevant as healthcare organizations face increasing frequency and complexity of crisis events. Leaders who understand and can manage interconnected system changes are better positioned to build resilient, adaptable healthcare organizations capable of responding to future challenges. The pandemic experience demonstrates that successful transformation requires not just technological adoption, but a deep understanding of how different organizational systems interact and evolve together.

Implications for Healthcare Leadership

The findings from this study offer critical insights for healthcare leaders seeking to navigate complex system transformations beyond crisis-driven responses.

System Transformation Requires Interconnected Change. We recommend that healthcare leaders recognize that meaningful innovation demands coordinated adaptation across technological, regulatory, social, and economic domains. Isolated interventions cannot create sustainable system-wide transformation.

Move Beyond Crisis-Driven Innovation. Sustainable transformation requires transitioning from reactive adaptation to proactive system design. Healthcare leaders must build organizational capabilities that enable continuous learning and system-wide reconfiguration.

Develop Multi-System Leadership Capabilities. Understanding complex healthcare challenges requires leaders to develop new cognitive approaches. This involves seeing beyond departmental boundaries, recognizing interconnected patterns, and creating meaning from ambiguous, rapidly changing environments. The ability to think systemically is crucial for driving meaningful change in a polycrisis.

Collaborative Potential Emerges Under Extreme Pressure. The pandemic revealed healthcare systems' latent capacity for rapid, coordinated change when confronted with existential challenges. Leaders should study these moments to understand how to overcome deeply entrenched institutional barriers.

Collaborative Momentum Requires Intentional Design. The unprecedented stakeholder alignment during the pandemic was not accidental. Leaders must develop explicit strategies to maintain cross-boundary partnerships, creating incentive structures and communication channels that persist beyond crisis conditions.

Create Psychological Safety. Developing environments that tolerate experimentation, capture innovative approaches, and destigmatize failure is crucial for ongoing organizational resilience. This goes beyond team-level psychological safety to organization-wide adaptive capacity. Create simple, regular opportunities for people to raise concerns without fear of negative consequences, such as designated meeting time for surfacing challenges. Actively recognize and reward instances when team members speak up about problems, suggest unconventional ideas, or admit errors, reinforcing that these behaviors are valued rather than punished. Finally, establish clear protocols for how mistakes will be handled as learning opportunities, not occasions for blame.

Study Limitations

While our research highlights important transformations in healthcare delivery through telemedicine during COVID-19, several contextual limitations should be considered. The scope of this paper centers on telemedicine's role during the pandemic as an adaptive response to extraordinary circumstances. Telemedicine, though transformative in many ways, is inherently limited in its applicability across all medical domains—particularly services requiring physical examinations, diagnostic imaging, or surgical interventions. Our analysis presents telemedicine not as a replacement for traditional care, but as a complementary strategy that proved vital during a public health emergency. During COVID-19, telemedicine effectively identified and managed suspected cases, triaged patients, reduced unnecessary in-person visits, prevented healthcare system overload, and limited viral spread—all supporting our findings about system transformation under crisis conditions.

Several limitations should also be noted in our analysis. Our reliance on published literature rather than primary data may not capture the full range of healthcare system transformations during the pandemic. Aggregate measures from national sources can obscure important variations in implementation approaches and outcomes across different healthcare

settings. The rapid nature of pandemic response means that some system changes and adaptations were not thoroughly documented in academic literature, potentially omitting important insights. Our examination of diverse healthcare settings, while broad, may not reflect unique implementation challenges encountered in different contexts not covered by currently available studies. The long-term implications of the system changes we identified require further investigation, as the sustained impact of pandemic-era adaptations continues to evolve. These limitations suggest opportunities for future research to deepen our understanding of healthcare system transformation during crisis periods.

Future Research Directions

Future research should comprehensively examine the long-term sustainability of crisis-driven healthcare transformations, particularly in telemedicine and their effectiveness in providing a standard of care. This investigation requires an interdisciplinary approach that explores the complex mechanisms of inter-systemic feedback loops, analyzing how regulatory changes impact technological, economic, and social adaptations in healthcare delivery. Researchers should develop proactive strategies for addressing organizational and cultural barriers, creating frameworks that help transform temporary crisis-driven innovations into enduring system improvements.

The ultimate objective is to provide healthcare leaders with actionable insights that explain how emergency measures can be developed into sustainable, transformative delivery models. By examining the intricate interactions between policy, infrastructure, technological capabilities, and stakeholder engagement, scholars can develop a robust understanding of systemic change—potentially reshaping our approach to large-scale organizational innovation in healthcare.

Finally, the case of telemedicine transformation during COVID-19 demonstrates generalizable concepts including but not limited to using crises as catalysts for overcoming institutional inertia, the value of taking a multi-system transformation approach, building collaborative capacity, balancing rapid responsiveness with sustainable change, and developing new leadership capabilities. Future research should investigate the degree to which such insights from the rapid technological development and adoption of telemedicine in healthcare generalize to leadership and organizational innovation across industries more broadly.

Conclusion

The COVID-19 pandemic's disruption of healthcare delivery provides a window into how complex healthcare systems can achieve rapid, fundamental transformation when confronted with existential challenges. The synchronized adaptation observed across technological, regulatory, social, and economic domains reveals that seemingly immutable barriers to healthcare innovation are not fixed constraints, but dynamic challenges that can be overcome through coordinated and intentional action.

This extraordinary period demonstrated the potential for systemic change when traditional organizational boundaries dissolve. The pandemic temporarily aligned stakeholder incentives across previously disconnected domains, revealing the latent capacity for collaborative innovation within healthcare systems. These moments of alignment offer critical insights into overcoming barriers to collective action.

However, the partial retreat from telemedicine innovations as crisis pressures receded exposes a fundamental challenge to sustainable transformation. The ability to change during a crisis, while important, is insufficient for lasting systemic improvement. The future of healthcare innovation demands more than reactive adaptation—it requires deliberately cultivating organizational capabilities that enable proactive, system-wide transformation.

Forward-thinking leaders now face a pivotal opportunity. Rather than returning to pre-crisis fragmentation, they can build on the collaborative foundation established during the pandemic. By intentionally designing collaboration systems that can function without crisis pressure, organizations can create more integrated, responsive healthcare ecosystems. The goal is to develop shared direction, alignment, and commitment among diverse stakeholders, transforming the temporary innovations of a crisis into enduring capabilities for continuous improvement.

These insights extend far beyond telemedicine, offering a broader perspective on addressing pressing healthcare challenges—from reducing health inequities to managing the escalating burden of chronic diseases. Organizations that develop these collaborative capabilities will be better positioned not just to weather future crises, but to drive fundamental changes that create more equitable, efficient, and resilient healthcare systems.

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