

Health Information Systems in Primary Care Networks: Drivers and Barriers to Adoption*

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Abstract

Digital tools are now part of everyday primary care, yet uptake is far from uniform. This narrative review asks what drives and what blocks adoption of health information systems (HIS) in primary care networks. A structured search of PubMed and Scopus for 2016 to 2026 identified 711 records; after screening, 154 met the inclusion criteria, and 47 were selected through explicit rules for in-depth discussion, spanning reviews, hybrid effectiveness-implementation trials, provider and patient surveys, and qualitative evaluations. Findings are grouped into five areas: telehealth; electronic health records, decision support, and information exchange; patient portals, mobile health, and connected devices; the factors shaping uptake among providers, patients, and organisations; and the frameworks that explain whether systems last. The COVID-19 pandemic was the main accelerant, but barriers were consistent: disrupted workflows, weak interoperability, uncertain funding, limited digital skills, and unequal access to devices and connectivity. Adoption is therefore a sociotechnical task, not a purely technical one; equity, provider engagement, and system integration decide whether HIS help the patients who need them most.

Keywords: health information systems; primary care; digital health adoption; telemedicine; health equity

Introduction

Primary care is where most people meet the health system, and it now runs on digital infrastructure. Health information systems (HIS) in this setting cover several tools: electronic health records (EHRs), clinical decision support (CDS), health information exchange, telemedicine platforms, patient portals, and mobile health (mHealth) applications. The promise is clear: they can widen access, streamline work, improve coordination, and support population health surveillance. The COVID-19 pandemic turned that promise into rapid change. In Ontario, office visits fell by about 79% in the first weeks of lockdown while virtual contacts rose 56-fold (Glazier et al., 2021), and similar shifts appeared across general practice elsewhere (Stummer et al., 2023; Fisher et al., 2022).

Fast uptake in a crisis is not the same as lasting adoption. Even before the pandemic, primary care physicians took up EHR features slowly and unevenly despite large investments (O'Donnell et al., 2018). A systematic review of rural primary care innovations found that digital technology improves access and service delivery only when context, infrastructure, and implementation are right (MacAskill et al., 2024). This review has three aims: to map the main drivers and barriers to HIS adoption in primary care, to organise them across the principal technology domains, and to draw out what they mean for implementation and public health. Its novel contribution is to bring the full range of HIS modalities into a single primary care frame and to read the evidence jointly through implementation science and information systems adoption theory, rather than examining any one technology in isolation.

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Methods

This review reports a structured search and screening process for transparency, though the synthesis is narrative rather than systematic. PubMed and Scopus were searched for records published between 2016 and 2026. The search combined four concept blocks with the Boolean AND operator: a setting block (ambulatory care, primary care, outpatient care, general practice), a technology block (digital health, eHealth, mHealth, telemedicine, health information technology, electronic health records), an adoption block (barriers, facilitators, adoption, implementation, uptake), and a public health block (public health, population health, health inequities, health outcomes). In PubMed these used MeSH and free-text fields, with an equivalent string in Scopus. Together the searches returned 711 records.

Studies were eligible if they concerned the adoption, implementation, or use of a health information system in a primary or ambulatory care setting and reported drivers, barriers, or outcomes. Studies set exclusively in secondary or hospital care, those with no digital component, and protocols without reported findings were out of scope or given lower weight. After 52 duplicates were removed, 659 records were screened by title and abstract. Of these, 371 were excluded and 288 were sought for full-text retrieval. Full text was available for 178; 24 were excluded at this stage, leaving 154 that met the criteria. Because a narrative synthesis cannot discuss 154 studies in equal depth, the discussion draws on a rule-based selection of 47.

Three rules governed that selection. First, all systematic and scoping reviews were retained, as they carry the highest evidential weight. Second, for each theme priority went to studies that used a named adoption or implementation framework, such as the NASSS framework (Nonadoption, Abandonment, Scale-up, Spread, and Sustainability; Greenhalgh et al., 2017), Normalisation Process Theory (May & Finch, 2009), RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance; Glasgow et al., 1999), the Consolidated Framework for Implementation Research (Damschroder et al., 2009), or the Technology Acceptance Model (Davis, 1989). Third, the remaining places per theme were filled to preserve variety in study design, region, and target population. This produced the working set of 47 studies summarised in Table 1. The approach still carries a risk of selection bias, a narrative format cannot pool effect sizes, and several included studies are protocols, so some outcomes are planned rather than observed. These limits are revisited in the discussion.

Table 1. Characteristics of the 47 studies selected for in-depth discussion, by domain and study type.

Study	Study type	Primary domain
Carrillo de Albornoz et al. (2022)	Review	Telehealth
Darley et al. (2022)	Review	Telehealth
Hamline et al. (2024)	Survey	Telehealth
Haun et al. (2023)	Trial	Telehealth
Ilali et al. (2023)	Review	Telehealth
Leighton et al. (2025)	Empirical study	Telehealth
Morgan et al. (2024)	Empirical study	Telehealth
Nkodo et al. (2024)	Empirical study	Telehealth
Olofsson et al. (2024)	Survey	Telehealth
Smyth et al. (2022)	Qualitative	Telehealth
Alves et al. (2023)	Empirical study	EHR & decision support
Ash et al. (2020)	Qualitative	EHR & decision support
Chan et al. (2023)	Survey	EHR & decision support
Coorey et al. (2021)	Empirical study	EHR & decision support
Cresswell et al. (2019)	Qualitative	EHR & decision support
Mangin et al. (2020)	Trial	EHR & decision support
Salloum et al. (2022)	Protocol	EHR & decision support
Avdagovska et al. (2020)	Review	Portals, mHealth & IoT
Bogulski et al. (2024)	Survey	Portals, mHealth & IoT
Jindal et al. (2018)	Empirical study	Portals, mHealth & IoT
Lyles et al. (2019)	Trial	Portals, mHealth & IoT
Lyles et al. (2025)	Protocol	Portals, mHealth & IoT
Nøhr et al. (2017)	Empirical study	Portals, mHealth & IoT
Peyroteo et al. (2021)	Review	Portals, mHealth & IoT
Ramirez et al. (2016)	Empirical study	Portals, mHealth & IoT

Renting et al. (2025)	Qualitative	Portals, mHealth & IoT
Tapuria et al. (2021)	Review	Portals, mHealth & IoT
Thomas et al. (2022)	Empirical study	Portals, mHealth & IoT
Tosto et al. (2020)	Empirical study	Portals, mHealth & IoT
Wallace et al. (2016)	Empirical study	Portals, mHealth & IoT
Fisher et al. (2022)	Empirical study	Adoption factors
Owoyemi et al. (2022)	Empirical study	Adoption factors
Saigí-Rubió et al. (2021)	Empirical study	Adoption factors
Weik et al. (2024)	Survey	Adoption factors
Glass et al. (2023)	Protocol	Implementation & sustainability
James et al. (2021)	Review	Implementation & sustainability
Owen et al. (2019)	Protocol	Implementation & sustainability
Choy et al. (2024)	Empirical study	Equity & public health
Knights et al. (2021)	Qualitative	Equity & public health
Poduval et al. (2025)	Qualitative	Equity & public health
Sleaby et al. (2026)	Empirical study	Equity & public health
Wikaire et al. (2022)	Empirical study	Equity & public health
Glazier et al. (2021)	Empirical study	Cross-cutting
Haimi (2023)	Review	Cross-cutting
MacAskill et al. (2024)	Review	Cross-cutting
O'Donnell et al. (2018)	Review	Cross-cutting
Stummer et al. (2023)	Survey	Cross-cutting

Telehealth and Virtual Consultations: The Most Studied Modality

Telemedicine is the most studied digital tool in primary care, and the evidence is shaped above all by the pandemic shift. For selected presentations, systematic reviews find that teleconsultations can reach outcomes comparable to in-person care while improving access and cutting waiting times (Carrillo de Albornoz et al., 2022; Ilali et al., 2023). The picture is nuanced for older adults, where telemedicine works only with tailored support so that people with sensory or cognitive limits are not left behind (Ilali et al., 2023). Among safety-net clinicians, adoption tracked with payment parity, a sense that the visit was clinically appropriate, and patient demand, while technical instability and doubts about care quality worked against it (Nkodo et al., 2024). National surveys link uptake to the characteristics of physicians and practices rather than the technology itself (Hamline et al., 2024), and Swedish data show physicians' intentions shifted sharply across the pandemic (Olofsson et al., 2024).

Acceptance rests on more than features. Clinicians valued the wider access from the rapid transition, yet some missed the physical examination and rapport of in-person care (Smyth et al., 2022). Patients made the same trade-off, weighing convenience against the loss of face-to-face contact, and felt it most for sensitive concerns such as depression and anxiety (Haun et al., 2023); their choices also varied with individual circumstances (Morgan et al., 2024). Reviews of online and asynchronous consultation add a qualification: the channel itself does not settle quality and safety, but its design and implementation do (Darley et al., 2022; Leighton et al., 2025).

Electronic Health Records, Decision Support and Information Exchange

If telemedicine is the visible face of digital primary care, EHRs, decision support, and interoperability are its foundation. The value of electronic health information depends on being able to reach and share it, and gaps in interoperability remain a central frustration for family doctors (Chan et al., 2023). When EHR-linked tools are well built, they change practice in measurable ways: an internet-based cardiovascular intervention embedded in primary care EHRs achieved documented implementation fidelity and user engagement (Coorey et al., 2021), and structured disease coding in routine EHR work improved data completeness and consistency (Mangin et al., 2020). Clinical decision support is the sharpest test of this logic, because its value depends on fit with the clinician's workflow. A multi-site needs assessment found real demand for worker-health CDS, yet identified workflow fit, alert burden, and EHR usability as the decisive barriers (Ash et al., 2020). The field is moving from single-site pilots to cross-practice scale-up, as in a planned hybrid trial of interoperable CDS for chronic pain (Salloum et al., 2022). System-level cases point the same way: a formative evaluation of NHS Scotland's Decision Support

Platform set out the expectations shaping its primary care roll-out (Cresswell et al., 2019), while qualitative work on Brazil's Unified Health System placed interoperability, infrastructure, and reduced bureaucracy at the centre of adoption (Alves et al., 2023).

Patient-Facing Systems: Portals, Mobile Health and Connected Devices

Patient portals move part of the HIS into patients' hands, and the literature shows two things at once: the potential is real, the uptake uneven. Scoping reviews map portal impact across the Quadruple Aim while noting that measurement is still fragmented (Avdagovska et al., 2020), and review evidence suggests patient access to EHRs can improve self-care (Tapuria et al., 2021). In practice, use follows social lines: portal use among vulnerable patients in a national research network was low and varied by demographic factors (Wallace et al., 2016; Bogulski et al., 2024), and log-file methods are being developed to measure actual usage rather than self-report (Tosto et al., 2020). Targeted help narrows the gap: a randomised trial found structured training improved portal skills and eHealth literacy among vulnerable patients, though sustained log-in needed more support (Lyles et al., 2019). Cross-national comparison of citizen access to health data in Denmark, Estonia, and Australia frames portals as a question of security, user support, and adoption rather than deployment alone (Nøhr et al., 2017). Mobile health reaches further still, especially in lower-resource settings. Observational work in safety-net clinics found strong patient interest in using mHealth to manage chronic disease (Ramirez et al., 2016), and integrated mHealth and CDS tools such as mWellcare were built to support hypertension and diabetes care in low-resource primary care (Jindal et al., 2018). Success depends on behaviour-change factors and routine integration: the MINISTOP child-health app was analysed with the COM-B model to identify the capabilities, opportunities, and motivations nurses needed to adopt it (Thomas et al., 2022). Connected devices extend patient-facing systems into the home, where HIS meet the Internet of Things (IoT). Sensors such as blood-pressure cuffs, glucose meters, and wearables feed patient-generated data back into primary care, but the device is rarely the limiting factor. Remote monitoring is technically feasible for chronic disease in primary care, yet evidence on its real-world sustainability remains limited (Peyroteo et al., 2021). Clinicians take up telemonitoring only when it fits their workflow and professional identity (Renting et al., 2025), and remote patient monitoring is now assessed for equitable integration into team-based care rather than for the sensor alone (Lyles et al., 2025). For primary care networks, capturing data is easy; the harder, organisational work is turning device readings into coordinated care and getting them into the EHR and clinical workflow.

What Shapes Adoption: Providers, Patients and Organisations

The same drivers and barriers recur across every tool. At the provider level, attitudes, digital maturity, and professional identity matter most: digital maturity in general practices tracks physicians' own characteristics and practice context (Weik et al., 2024), and how strongly a clinician identifies with a technology shapes whether they use telemonitoring at all (Renting et al., 2025). At the patient level, trust and prior contact shape engagement, with perceived usefulness and ease of use preceding behaviour (Saigí-Rubió et al., 2021). Organisational and structural factors are decisive: reviews of tools for community health workers in Africa stress the need for frameworks, funding, and governance to move from pilot to scale (Owoyemi et al., 2022), and temporary pandemic payment rules were a key enabler of telemedicine, so uncertainty about their continuation is now among the strongest threats to lasting adoption (Fisher et al., 2022; Nkodo et al., 2024). Workforce capacity, training, and on-site digital champions recur as enabling conditions, underlining that adoption is as much about people and incentives as about software. These patterns line up with long-standing theory on technology adoption. The Technology Acceptance Model holds that perceived usefulness and ease of use drive intention to use, supported by Catalan data on digital consultation tools (Davis, 1989; Saigí-Rubió et al., 2021). The Unified Theory of Acceptance and Use of Technology broadens this to social influence and facilitating conditions such as infrastructure and support (Venkatesh et al., 2003), matching the finding that organisational and structural factors, not user attitudes alone, decide uptake. Rogers' diffusion of innovations explains the uneven, socially patterned spread seen in portal and mHealth use (Rogers, 2003). DeLone and McLean add that system, information, and service quality jointly determine use and net benefits (DeLone & McLean, 2003); in these terms, the recurring complaints about interoperability, alert burden and EHR usability are quality failures that depress use. Together these models converge on the review's central claim: adoption is a sociotechnical outcome, not a property of the device.

Implementation Frameworks and the Path to Sustainability

A clear feature of the recent evidence is the open use of implementation theory. The NASSS framework explains why video consulting spreads in some places and stalls in others, locating failure not in the technology but in the

complexity of the condition, the adopters, the organisation, and the wider system (Greenhalgh et al., 2017; James et al., 2021). Normalisation Process Theory has been used to study how asynchronous telemedicine becomes routine practice, or fails to (May & Finch, 2009; Leighton et al., 2025). Planned hybrid effectiveness-implementation designs now test cost, effectiveness, and sustainment together, as in trials of digital therapeutics for substance use disorder (Glass et al., 2023) and implementation facilitation to embed video-delivered mental health care in rural clinics (Owen et al., 2019), treating adoption, maintenance, and de-adoption as primary outcomes. The pattern is consistent: tools not built into workflow, payment, and professional roles are often abandoned once external pressure eases.

Digital Health Equity and Public Health

Equity is the theme that cuts across all the others. The digital divide means the people most likely to gain from wider access are often the least able to use digital services. Studies of the digital health experience in primary care show how socioeconomic disadvantage compounds already reduced access to patient-initiated digital care (Choy et al., 2024), and commentary on Australian primary care warns that fast digital expansion can reinforce the inverse care law unless the divide is tackled deliberately (Sleaby et al., 2026). Community-based digital inclusion programmes, studied through the Consolidated Framework for Implementation Research, point to what helps: trusted community spaces, devices, connectivity, and personal support are needed for uptake among disadvantaged groups (Poduval et al., 2025).

These equity issues are public health issues. Studies of migrants' access to primary care during pandemic digitalisation found the move to remote care created new barriers for groups already on the margins, with effects reaching vaccine roll-out and continuity of care (Knights et al., 2021). Work with Indigenous populations reached a similar view: telehealth could reduce inequities for Māori during COVID-19 but could also introduce access barriers that widen them (Wikaire et al., 2022). The implication for HIS design is that equity cannot be added later; it must be a first-order design and implementation criterion, judged alongside efficiency and clinical effectiveness.

Synthesis: Weighing Opportunities Against Barriers

The evidence is not uniformly positive. Teleconsultation reviews report outcomes comparable to in-person care for selected presentations (Carrillo de Albornoz et al., 2022), yet the evidence base is heterogeneous and effectiveness is not established for all conditions (Ilali et al., 2023; Peyroteo et al., 2021). Portals are linked to better self-care (Tapuria et al., 2021), but uptake is low and socially skewed, so population-level benefit remains uncertain (Wallace et al., 2016; Lyles et al., 2019). Telemedicine is cast both as a way to reduce inequities and as a force that can widen them (Wikaire et al., 2022; Haimi, 2023). These contradictions reconcile once outcomes are seen to depend less on the tool than on the context and quality of implementation. The opportunities are real: better access, coordination, patient activation, and reach (Glazier et al., 2021; Chan et al., 2023; Coorey et al., 2021; Ramirez et al., 2016; Owoyemi et al., 2022). So are the barriers: clinician workload and usability (Ash et al., 2020), weak interoperability and infrastructure (Alves et al., 2023), uncertain funding and governance (Nkodo et al., 2024), and digital divides that fall hardest on the patients with the greatest need (Choy et al., 2024; Poduval et al., 2025). The literature therefore supports cautious optimism conditioned on implementation, not blanket endorsement.

Conclusion

The evidence converges on a single message: adopting health information systems in primary care is a sociotechnical achievement, not a technical certainty. Telemedicine, EHRs, decision support, portals, mHealth, and connected devices each offer real gains in access, efficiency, coordination, and population health, yet each is held back by the same barriers of workflow, interoperability, funding, skills, and infrastructure. The pandemic proved primary care can digitalise at speed; the task now is to convert emergency uptake into lasting, equitable integration, using implementation frameworks such as NASSS, Normalisation Process Theory, RE-AIM, and CFIR alongside the adoption models that explain why quality, facilitating conditions, and social influence matter as much as the technology. For primary care networks, the decisive question is no longer whether to adopt HIS, but how to embed them so the benefits reach the people who need them most.

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