

Sexually transmitted infections and hypertension management among men who have sex with men: a literature review of early telemedicine approaches

Manejo de infecciones de transmisión sexual y hipertensión en hombres que tienen sexo con hombres: una revisión de la literatura sobre enfoques tempranos de telemedicina

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Resumen

This systematic review synthesizes evidence on telemedicine applications for sexually transmitted infection (STI) and HIV services among men who have sex with men (MSM), with an integrated perspective on implications for chronic disease management such as hypertension. Following a structured search of three databases, 12 studies met the inclusion criteria. The findings reveal that telemedicine is primarily utilized for HIV prevention counseling, pre-exposure prophylaxis (PrEP) delivery, and sexual health information dissemination, demonstrating high acceptability among MSM largely due to enhanced privacy and reduced stigma. However, its application for comprehensive STI diagnosis and treatment remains limited, often relying on hybrid models that combine remote consultation with essential in-person laboratory services. Critically, the core functional components of these digital interventions—including mobile health apps for education, teleconsultation for clinical assessment, and home-based specimen collection integrated with clinical support—are not con-

dition-specific. These components form a versatile toolkit that can be adapted to manage hypertension, which shares similar requirements for ongoing monitoring, lifestyle counseling, and medication management. The significant overlap in barriers addressed by telemedicine, such as discreet access and continuity of care, for both sexual health and chronic conditions presents a compelling rationale for integrated care models. Therefore, rather than developing parallel systems, future digital health strategies should focus on designing holistic telemedicine platforms capable of addressing multiple co-occurring health needs, including STI risk and cardiovascular health, during single, person-centered encounters. This approach could transform telemedicine from a tool for discrete services into a cornerstone of comprehensive preventive healthcare.

Keywords: Telemedicine, Men Who Have Sex with Men, Sexually Transmitted Infections, Hypertension, Digital Health, Integrated Care, Systematic Review, mHealth.

Esta revisión sistemática sintetiza la evidencia sobre las aplicaciones de la telemedicina para servicios de infecciones de transmisión sexual (ITS) y VIH entre hombres que tienen sexo con hombres (HSH), con una perspectiva integral sobre las implicaciones para el manejo de enfermedades crónicas como la hipertensión. Tras una búsqueda estructurada en tres bases de datos, 12 estudios cumplieron los criterios de inclusión. Los hallazgos revelan que la telemedicina se utiliza principalmente para la consejería preventiva del VIH, la administración de profilaxis preexposición (PrEP) y la difusión de información sobre salud sexual, demostrando una alta aceptabilidad entre los HSH, en gran medida debido a la mayor privacidad y la reducción del estigma. Sin embargo, su aplicación para el diagnóstico y tratamiento integral de las ITS sigue siendo limitada, y a menudo se basa en modelos híbridos que combinan la consulta remota con servicios esenciales de laboratorio presenciales. Es fundamental que los componentes funcionales centrales de estas intervenciones digitales —incluyendo aplicaciones móviles de salud para educación, teleconsulta para evaluación clínica y recolección de muestras domiciliarias integradas con apoyo clínico— no sean específicos de cada condición. Estos componentes conforman un conjunto de herramientas versátiles que se pueden adaptar para el manejo de la hipertensión, que comparte requisitos similares para la monitorización continua, el asesoramiento sobre estilo de vida y la gestión de la medicación. La importante superposición de barreras que aborda la telemedicina, como el acceso discreto y la continuidad de la atención, tanto para la salud sexual como para las enfermedades crónicas, presenta una justificación convincente para los modelos de atención integrada. Por lo tanto, en lugar de desarrollar sistemas paralelos, las futuras estrategias de salud digital deberían centrarse en el diseño de plataformas holísticas de telemedicina capaces de abordar múltiples necesidades de salud coexistentes, incluyendo el riesgo de ITS y la salud cardiovascular, durante encuentros únicos y centrados en la persona. Este enfoque podría transformar la telemedicina, de una herramienta para servicios discretos a una piedra angular de la atención médica preventiva integral.

Palabras clave: Telemedicina, Hombres que tienen sexo con hombres, Infecciones de transmisión sexual, Hipertensión, Salud digital, Atención integrada, Revisión sistemática, mHealth.

The pursuit of optimal population health is a cornerstone of societal development, extending beyond clinical care to encompass fundamental social determinants such as education, environment, and equitable access to services. Within this framework, addressing chronic non-communicable diseases (NCDs) has emerged as a global priority. Cardiovascular diseases (CVDs) constitute a leading cause of mortality worldwide, with their burden projected to rise significantly in the coming decades¹. Hypertension stands as a predominant and modifiable risk factor for cardiovascular morbidity and mortality, intricately linked with other metabolic conditions such as obesity and type 2 diabetes^{2,3}. The global epidemic of obesity, characterized by excessive adipose tissue accumulation, is a key driver of hypertension pathogenesis through mechanisms including increased sympathetic nervous system activity, renal dysfunction, and systemic inflammation^{4,5}.

Concurrently, infectious disease burdens, including sexually transmitted infections (STIs), remain a persistent public health challenge. STIs can lead to significant acute and long-term reproductive and systemic health complications. The clinical management of STIs is sometimes complicated by non-specific or asymptomatic presentations, which can delay diagnosis and facilitate ongoing transmission⁶. Importantly, a syndemic relationship exists between certain STIs, behavioral risk factors, and NCDs. For instance, chronic inflammation associated with recurrent or untreated STIs may theoretically exacerbate underlying endothelial dysfunction, a common pathway in hypertension and atherosclerosis^{7,8}. Furthermore, populations such as men who have sex with men (MSM) may face intersecting health risks, including higher prevalence of STIs, and may also experience disparities in the prevalence and management of metabolic conditions like hypertension due to stigma, healthcare access barriers, and psychosocial stress⁹.

Telehealth and teleconsultation have been increasingly deployed to overcome barriers to care, delivering health information, triage, counselling, and follow-up across various medical fields, including STI/HIV services and chronic disease management^{10,11}. Reviews of digital health interventions indicate that technology-enabled approaches can support information provision, testing pathways, and linkage to services in diverse settings^{12,13}. For MSM, digital tools have shown promise in supporting sexual health service engagement, with studies highlighting high acceptability for services that prioritize privacy and confidentiality^{14,15}.

However, the clinical scope and integration of telemedicine models warrant careful examination. While effective for information dissemination and counselling, remote

care for conditions requiring physical examination or laboratory confirmation, such as many STIs and hypertension diagnosis/monitoring, presents distinct challenges¹⁶. The potential for telemedicine to serve as a bridge, connecting individuals to comprehensive care that addresses both infectious and chronic disease risks—such as integrating STI screening with hypertension risk assessment—remains an underexplored area. This is particularly relevant for key populations where fragmented care is common.

This systematic review therefore aimed to synthesize existing evidence on early telemedicine and teleconsultation approaches for STI prevention and care among MSM. A secondary, integrative aim was to critically examine the reported models, their components, and implementation considerations through a lens that identifies potential synergies and lessons for developing more holistic digital health strategies. Such strategies could potentially address concurrent health priorities, including the screening and management of cardiovascular risk factors like hypertension, within high-risk populations.

dent reviewers based on the pre-defined eligibility criteria. Articles were included if they (i) described or evaluated a telemedicine or teleconsultation intervention or modality, (ii) directly addressed sexually transmitted infections (including HIV) as a primary or secondary focus, and (iii) specifically involved men who have sex with men (MSM) as the study population or a distinct, analyzable subgroup. Discrepancies between reviewers were resolved through discussion or consultation with a third reviewer.

Following title and abstract screening, the full texts of potentially eligible articles were retrieved and assessed in detail against the same criteria. Studies were excluded at the full-text stage if the teleconsultation component was not directly related to STI/HIV services (e.g., general mental health teleconsultation) or if the study sample was not specifically MSM (e.g., general population studies without disaggregated data). The reasons for exclusion at the full-text stage were documented. The entire selection process, including the number of records identified, screened, assessed, and included, is detailed in a PRISMA flow diagram (Figure 1; Figure 2).

Study Design and Reporting

This study was conducted as a systematic review of the literature. The reporting followed the guidelines outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement to ensure methodological rigor and transparency¹⁷.

Search Strategy and Eligibility Criteria

In August 2025, a comprehensive systematic search for relevant literature was performed across three major electronic databases: PubMed, ProQuest, and ScienceDirect. The search strategy was designed to capture studies at the intersection of telemedicine, sexually transmitted infections, and men who have sex with men. The following Boolean search string was applied: (“Sexually Transmitted Disease” OR “STD”) AND (“Homosexual”) AND (“Telemedicine” OR “Teleconsultation”). No initial date restrictions were imposed, and the search included all records up to the date of execution in August 2025. The search was limited to documents classified as articles and published in the English language.

Study Selection Process

The database search yielded an initial total of 162 records, with contributions from PubMed (n=18), ProQuest (n=106), and ScienceDirect (n=38). All retrieved records were imported into reference management software for duplication and screening. The study selection process was performed in two sequential stages. First, titles and abstracts were screened for relevance by two indepen-

Figure 1. Prisma Flow Diagram of Study Identification, Screening, Full-Text Assessment, and Inclusion

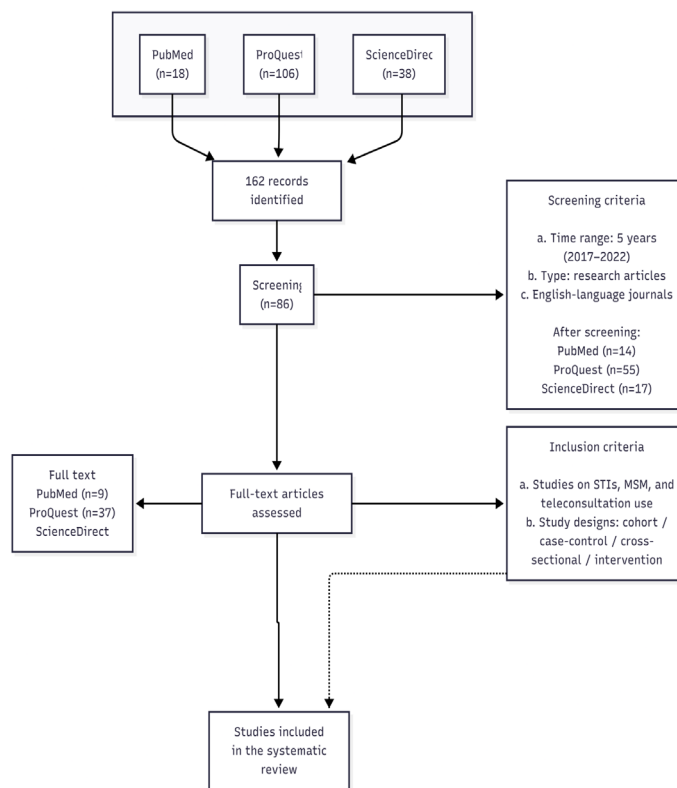
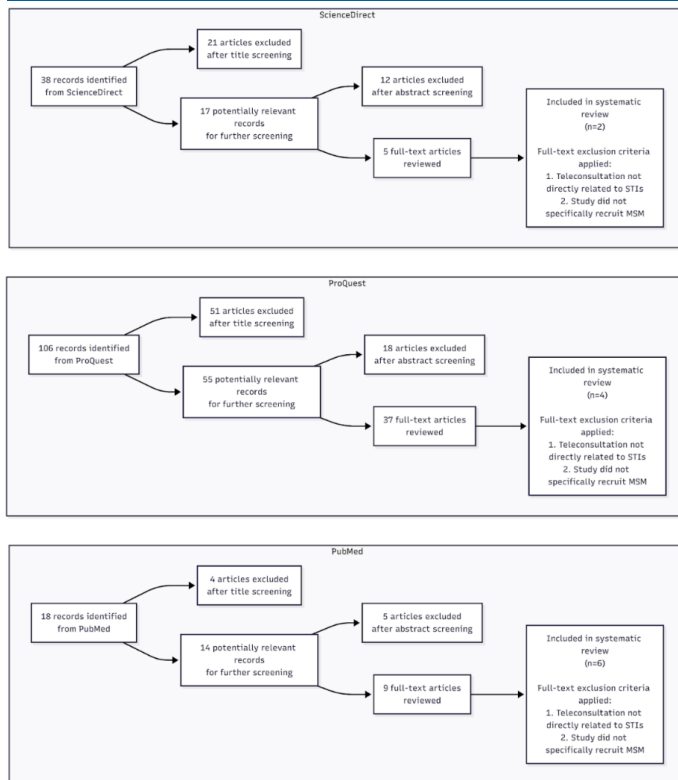


Figure 2. Database-specific study selection process across PubMed, ProQuest, and ScienceDirect



Data Extraction

Data from the final set of included studies were extracted systematically using a standardized data extraction form. The extracted information included: first author and publication year; study design (e.g., cross-sectional, cohort, interventional pilot); sample characteristics and size; a detailed description of the telemedicine/digital health intervention or modality; and key findings related to STI/HIV outcomes, feasibility, acceptability, and implementation considerations. Given the anticipated heterogeneity in study designs, interventions, and reported outcomes across the included articles—ranging from preference assessments to pilot interventions—a meta-analysis was deemed inappropriate. Therefore, the evidence was synthesized using a narrative approach. The findings were thematically grouped to identify common patterns, modalities, and gaps in the application of telemedicine for STI services among MSM. Furthermore, the synthesized models were critically analyzed to explore their implicit components and potential adaptability for integrated care approaches that could address concurrent chronic conditions such as hypertension.

Results

Study Selection

The systematic search across the three databases yielded a total of 162 records. Following the removal of duplicates, 86 unique records underwent title and abstract screening. Of these, 35 records were excluded as they did not meet the eligibility criteria upon initial review. The remaining 51 full-text articles were thoroughly assessed for eligibility. Ultimately, 39 studies were excluded at the full-text stage, with the primary reasons being that the teleconsultation service was not directly related to sexually transmitted infections (n=26) or that the study population did not specifically focus on men who have sex with men (n=13). Consequently, 12 studies were found to satisfy all inclusion criteria and were incorporated into this systematic review.

The 12 included studies encompassed a diverse range of research designs and telemedicine applications, published between 2018 and 2022. The designs included cross-sectional surveys^{18,19,20}, cohort analyses²¹, interventional pilots and protocols^{22,23,24}, feasibility studies²⁵, and secondary evidence syntheses such as systematic reviews²⁶ and expert commentaries²⁷. The sample sizes varied considerably, from smaller pilot studies involving 35 participants²² to larger surveys encompassing over 4,000 individuals²³.

Table 1: Categorization of Included Studies by Primary Telemedicine Focus

Study Focus Category	Number of Studies	Representative Examples (Author, Year)
Acceptability & Preferences	3	Nguyen et al., 2020 ¹⁸ ; Shrestha et al., 2020 ¹⁹ ; Jakob et al., 2020 ²⁰
Prevention & Risk Reduction	3	Bauermeister et al., 2019 ²² ; Yan et al., 2020 ²³
Testing & Treatment Pathways	2	Sullivan et al., 2019 ²⁴
PrEP Service Delivery	2	Hoagland et al., 2020 ²⁵ ; Schumacher et al., 2022 ²¹
Conceptual Synthesis	2	Refugio & Klausner, 2018 ²⁷ ; Meiksin et al., 2021 ²⁶

The telemedicine interventions and digital modalities examined were equally varied. To illustrate the core components of these interventions, the following table summarizes the key technological modalities and their intended functions as described in the primary studies.

Table 2: Digital Modalities and Their Primary Functions in Included Studies

Digital Modality	Primary Function(s)	Example Application from Studies
mHealth Apps / Platforms	Information dissemination, self-assessment, appointment reminders, medication adherence tracking.	PrEPTECH app for PrEP information and telehealth linkage ²⁵ ; apps for STI prevention information ²⁰ .
Web-based / Online Interventions	Structured educational programs, behavioral risk reduction modules, partner notification services.	Online HIV prevention intervention (myDEX project) ²² ; web-based partner notification protocol ²³ .
Teleconsultation (Video/Audio)	Clinical consultation, risk assessment, counselling, results disclosure, prescription management.	Video consultation for STI results and treatment guidance ²⁴ ; teleconsultation for PrEP follow-up ^{21,25} .
Home-based Testing Kits + Digital Support	Remote specimen collection, instructional support, electronic result return.	Home specimen collection for STI testing with video guidance ²⁴ .
Social Media / Dating Apps Integration	Outreach, health promotion, stigma reduction, service linkage.	Using platforms like WeChat and Blued for recruitment and health education ²³ .

The analysis of the included studies revealed that telemedicine and digital health approaches for MSM in the context of STI/HIV services can be categorized into five distinct, though sometimes overlapping, themes.

The first theme pertained to the acceptability and preferences for eHealth and mHealth tools among MSM. Multiple studies reported a high penetration of smartphone ownership and frequent use of online platforms to seek sexual health information within this population^{18,19}. This established digital engagement underscores the feasibility of delivering health interventions via mobile channels. Studies also highlighted that confidentiality and privacy were paramount concerns influencing the acceptance and use of these digital tools^{22,24}.

The second theme involved telehealth-supported testing and treatment pathways. A notable pilot study explored a model for male couples, integrating home-based specimen collection for STIs with video consultation support and remote follow-up for treatment²⁴. This model demonstrated the potential for telemedicine to facilitate discrete testing and management, though it also surfaced challenges related to participant retention and the logistical complexity of multi-step processes.

The third theme focused on digital interventions for prevention and behavioral risk reduction. This included online HIV prevention programs that reported positive effects on reducing risky sexual behaviors²², as well as protocols for mobile-based partner notification strategies²³. These interventions leverage digital platforms to extend the reach of traditional public health measures.

A fourth, emerging theme was the telemedicine delivery of pre-exposure prophylaxis (PrEP) and service adaptation, particularly noted during the COVID-19 pandemic. Studies described hybrid models where teleconsultation was used for screening, counselling, and follow-up, while in-person visits were reserved for essential services like required HIV testing^{21,25}. One cohort analysis noted that such adaptations allowed for the maintenance and even increase of PrEP uptake during the pandemic, without a significant negative impact on concurrent STI testing outcomes in their setting²¹.

Finally, a fifth theme consisted of higher-level evidence and conceptual syntheses. This included an expert review emphasizing the critical need to integrate STI prevention strategies into broader HIV care frameworks for MSM²⁷, and a systematic review proposing theory-informed pathways through which eHealth interventions can influence sexual health outcomes²⁶. These syntheses provide a crucial backdrop for interpreting primary study findings and guiding future intervention design.

Table 3: Reported Outcomes and Key Implementation Considerations

Thematic Area	Primary Reported Outcomes	Key Implementation Considerations & Challenges
Acceptability & Preferences	High smartphone access (>99% in one study ¹⁹); frequent online health info seeking; strong preference for confidential services.	Ensuring data security and privacy; designing user-friendly interfaces; addressing digital literacy.
Testing & Treatment Pathways	Successful specimen collection & return; treatment completion for those testing positive ²⁴ .	High attrition in multi-step models; need for lab integration; managing partner notification remotely.
Prevention & Risk Reduction	Reduction in reported condomless anal sex ²² ; feasibility of digital partner notification ²³ .	Sustaining engagement over time; ensuring ethical partner notification; integrating with existing platforms.
PrEP Service Delivery	Maintained/Increased PrEP uptake during pandemic ²¹ ; high satisfaction with telehealth models ²⁵ .	Navigating regulations for in-person testing (e.g., HIV); ensuring medication access; managing side effects remotely.

Across these themes, a consistent narrative emerged: telemedicine is viewed as a highly acceptable and feasible modality for delivering discrete information, counselling, and prevention services to MSM. However, the evidence base for its role in direct STI diagnosis, treatment, and integrated management of co-morbidities remains nascent. To contextualize these findings within a broader framework of chronic disease management, the following table proposes potential analogies and lessons from telemedicine models for hypertension care, based on the functional components identified in this review.

Table 4: Potential Analogies and Translational Insights for Hypertension Management

Telemedicine Function for STIs (from Evidence)	Potential Analogy / Application for Hypertension Management	Key Requirement / Consideration
mHealth apps for STI information & prevention.	Apps for hypertension education, salt intake tracking, medication adherence, and blood pressure logging.	Clinical validation of apps; integration with electronic health records (EHRs).
Teleconsultation for PrEP counselling & follow-up.	Teleconsultation for antihypertensive medication management, dose titration, and lifestyle counselling.	Accurate home blood pressure monitoring equipment; clear protocols for urgent care referral.
Home-based STI testing kits with digital support.	Home blood pressure monitors with Bluetooth/data sync for remote patient monitoring (RPM).	Device accuracy; patient training; data security and clinician workflow for data review.
Digital platforms for discrete access & stigma reduction.	Telehealth portals offering discrete access to hypertension care, beneficial for groups facing stigma or access barriers.	Ensuring equitable access to technology (digital divide).
Hybrid models (telehealth + essential in-person visits).	Hybrid hypertension care: routine follow-up via telehealth, with in-person visits for initial diagnosis, complications, or lab tests.	Defining clear clinical guidelines for what requires in-person evaluation.

This comparative perspective highlights that while the clinical endpoints differ, the operational models, barriers (privacy, access), and enabling technologies for digital STI and hypertension care share significant common ground. The gaps identified in the STI telemedicine literature—such as the need for integrated lab services and robust follow-up pathways—are directly relevant to designing effective digital health strategies for chronic conditions like hypertension.

Discussion

This systematic review synthesizes evidence on the application of telemedicine for sexual health services among men who have sex with men (MSM). The findings indicate that while digital interventions have primarily focused on HIV prevention and service continuity, the identified operational frameworks and components offer valuable insights for developing more integrated care models. Specifically, the translatability of these approaches to the management of chronic conditions such as hypertension, which represents a major and often concurrent health burden, warrants careful consideration. The high acceptability and feasibility of digital modalities for delivering discreet information, counseling, and prevention services to MSM, as consistently reported across studies^{18,19,22,24}, stem from their ability to address key barriers like stigma and privacy concerns. These same barriers are frequently cited in the literature as obstacles to effective hypertension screening and long-term management, particularly among populations facing healthcare disparities^{2,9}.

The review reveals a distinct gap between the use of telemedicine for information/counseling and its application for definitive clinical management requiring diagnostics. Most successful models for STIs, such as PrEP delivery, adopted hybrid approaches that combined remote consultations with essential in-person components (e.g., laboratory testing for HIV)^{21,25}. This mirrors a fundamental requirement in hypertension care, where accurate diagnosis and monitoring rely on validated blood pressure measurements and occasional laboratory work. The pilot model for home-based STI testing²⁴ presents a compelling analogy for remote patient monitoring (RPM) in hypertension, where home blood pressure monitors serve a similar function to home specimen kits. Both models depend on patient engagement, reliable technology, and a secure clinical pathway for data interpretation and intervention. However, the noted challenges in these telemedicine models—such as participant attrition in multi-step processes and the need for robust laboratory integration²⁴—are critical cautionary notes. They highlight that simply transferring a service to a digital platform does not guarantee effectiveness; the entire clinical pathway, from patient engagement to result management and treatment escalation, must be thoughtfully (re)designed.

The syndemic perspective linking inflammatory pathways between chronic infections and cardiovascular disease^{7,8} provides a biological rationale for integrated care. A telemedicine encounter initiated for STI screening or PrEP management presents a strategic opportunity to seamlessly incorporate cardiovascular risk assessment, including hypertension screening. Current models are

largely siloed, but the digital tools and platforms described (mHealth apps, video consultations) possess the inherent functionality to support such expansion. For instance, a teleconsultation platform for sexual health could include standardized prompts for blood pressure self-reporting, family history of cardiovascular disease, or lifestyle counseling. This aligns with a broader shift in healthcare towards person-centered, holistic prevention strategies rather than disease-specific vertical programs.

Several limitations of the current evidence base constrain the strength of these conclusions. The included studies were heterogeneous in design, often small-scale pilots or observational studies, with a scarcity of robust comparative effectiveness research against standard in-person care. Many studies measured acceptability or feasibility rather than clinical outcomes like STI incidence or sustained viral suppression. Furthermore, while the potential for integration with chronic disease management is theorized, no identified study explicitly tested a combined STI-hypertension telemedicine intervention. Future research must prioritize such integrated models, employing rigorous designs to evaluate their clinical efficacy, cost-effectiveness, and long-term impact on both infectious and non-communicable disease outcomes. Implementation science research is also needed to understand how to embed these models sustainably within diverse healthcare systems, ensuring they advance health equity rather than exacerbate existing digital divides.

Conclusions

This systematic review concludes that early telemedicine approaches for STI and HIV services among MSM have demonstrated high acceptability and feasibility, particularly for components involving information delivery, counseling, and prevention support such as PrEP management. The evidence for telehealth as a standalone pathway for comprehensive STI diagnosis and treatment is more limited but points to promising hybrid models. A critical analysis of these models reveals that their core components—mHealth apps for education and engagement, teleconsultation for clinical assessment, and home-based monitoring integrated with clinical support—are not disease-specific. These components form a versatile digital health toolkit that can be adapted to manage chronic conditions like hypertension, which shares similar requirements for ongoing monitoring, lifestyle modification, and medication management.

The significant overlap in barriers addressed by telemedicine (stigma, privacy, access) for both sexual health and chronic disease care in vulnerable populations pres-

ents a compelling argument for integration. Rather than developing parallel digital systems, there is a strategic opportunity to design holistic telemedicine platforms that can address multiple co-occurring health needs during a single patient encounter. Future efforts should focus on developing and evaluating such integrated digital health interventions. These interventions should link telehealth consultations with accessible diagnostics (e.g., home BP monitors, lab kits), leverage data for personalized risk assessment, and ensure seamless connection to treatment and follow-up for both STIs and cardiovascular risk factors. By doing so, digital health can evolve from a tool for discrete services to a cornerstone of comprehensive, preventive, and person-centered healthcare for populations like MSM, who stand to benefit greatly from innovative and discreet care delivery models.

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