

Teledermatology in the diagnosis and treatment of sexually transmitted infections: a narrative review

Julia Woźna, Jan Stępką, Andrzej Bałoniak, Ryszard Żaba

Department of Dermatology and Venereology, Poznan University of Medical Sciences, Poznan, Poland

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Abstract

Teledermatology is a dynamically developing field of medicine with the potential to significantly impact the future functioning of the healthcare system, including the prevention, diagnostics, and treatment of sexually transmitted infections (STIs). While its implementation has resolved numerous issues associated with the traditional patient management model for STIs, the risk associated with handling sensitive patient data in a virtual space must not be overlooked. This article presents a literature review regarding the application of teledermatology in the diagnostics and treatment of STIs, with a particular focus on addressing relevant problems, potential obstacles, and examining the impact of the COVID-19 global epidemic on the development of this field.

Key words: telemedicine, sexually transmitted infections, COVID-19.

Introduction

In the digital era, medicine is advancing with technologies like teledermatology, which allows for remote skin disease management and educates patients [1]. Dermatologists using this technology often address venereology, focusing on sexually transmitted infections (STIs).

STIs, including chlamydia, gonorrhoea, genital herpes, HPV, syphilis, and HIV, are transmitted via sexual contact and may affect the skin and other organs [2, 3]. Some of these infections often have no symptoms, yet can still be spread to others during sexual activity.

Patients with STIs may avoid in-person consultations due to shame or logistical issues [4, 5]. Teledermatology offers a solution by reducing the need for physical visits. It is becoming more accessible and effective in treating conditions, including STIs [6, 7]. While telemedicine and teledermatology bring benefits like convenience and quicker consultations, their integration into healthcare systems also poses challenges that need careful consideration [8, 9].

This article explores the impact of teledermatology on STI diagnostics, its benefits, limitations, and future prospects.

Sexually transmitted infections – numerical data

According to the CDC report, in 2021, the United States witnessed an increase in STI cases. The number

of reported chlamydia infections reached 1.6 million, reflecting an increase of 4.1 percent compared to 2020 and indicating a return to pre-COVID-19 global epidemic levels. Furthermore, gonorrhoea cases have surged by 28 percent since 2017, totalling over 700,000. Simultaneously, syphilis case reports have climbed by 74% since 2017, amassing a total exceeding 176,000 in 2021. The report also underscores the imperative to strengthen care for individuals most susceptible to these infections, including those identifying as homosexual and bisexual, as well as members of racial and ethnic minorities [3]. The aforementioned data imply that despite societal interventions and educational campaigns, global infection numbers are escalating. Thus, it becomes pertinent to explore and deploy innovative methods and solutions, such as teledermatology, to efficaciously fight the rising tide of STI.

Teledermatology

Teledermatology (TD) is a branch of dermatology that utilises information and communication technologies for remote diagnosis, monitoring, treatment, prevention, conducting research, and education in the field of dermatology [10]. There are four main models of teledermatology practice: consultation, in which the referring physician consults a dermatologist about the patient's symptoms; triage, where dermatologists decide on the

Address for correspondence: Julia Woźna, Department of Dermatology and Venereology, Poznan University of Medical Sciences, 49 Przybyszewskiego St, 60-356 Poznan, Poland, phone: +48 666 370 777, e-mail: juliawozna.poczta@gmail.com

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priority of procedures and referrals; direct care, wherein dermatologists consult with patients via video conferences or patients send photos of dermatological changes directly to their doctor; and observation, during which doctors monitor the dermatological condition and its response to treatment [9]. Additionally, telemedical practice enables the collection of samples of the patient's biological material at home, necessary for diagnostic tests, allowing patients to receive medical care without leaving their residence. When needed, they may be invited to visit a clinic [6].

Prior to COVID-19, teledermatology was limited by barriers such as insurance reimbursement and licensing issues. The pandemic's impact on in-person care led to regulatory shifts, prompting healthcare adaptations that preserved resources and reduced exposure. These changes have carved out new norms for future application of teledermatology [11, 12].

Telemedicine is rapidly evolving, providing new options for patient care. The most convincing evidence for the effectiveness of telemedicine in making diagnostic and therapeutic decisions has been amassed in the fields of psychiatry and dermatology [8]. Studies show teledermatology effectively aids diagnosis and therapy, with patients appreciating its accessibility, care quality, and doctor interactions [9]. Lower satisfaction may stem from technical issues, privacy worries, limited procedures, and lack of physical exams, with patient views varying by demographics like tech support, digital literacy, age, income, and disease type [13].

Development of telemedicine, STI prevention and diagnostics

Teledermatology also addresses the prevention of STIs, with numerous studies focusing on utilizing multimedia communication as a preventive tool aimed at mitigating the spread of these infections.

In 2013, researchers reviewed HIV/STI-related apps from the Apple iTunes and Android Google Play stores, assessing user reviews, functionality, and content in prevention and care. They found most apps lacked user engagement and positive feedback. The study suggested greater collaboration between healthcare providers and developers to improve the apps' credibility [14].

Nicolas *et al.*'s study evaluated how an interactive website, "Sexunzipped", compared with a purely informational one in educating young people about sexual health [15]. "Sexunzipped" used quizzes and activities to prompt user engagement and reflection, features not present on the informational site. Results showed participants favoured the interactive approach, felt more engaged, and appreciated the reflective aspect of the research. The findings suggest interactive web platforms could effectively reach and educate the youth, a group often less accessible through traditional health education methods.

A UK study in 2016 found young people view telemedicine as a positive option for diagnosing STIs [16], a significant finding since this age group accounts for about half of STI cases [17]. Young individuals often face stigma and fear recognition at clinics, deterring treatment [18, 19]. Tele-diagnosis is favoured by youth and may lead to better STI management than traditional visits. Yet, concerns over the privacy of teleconsultations, particularly video calls, persist [20]. Ensuring confidentiality in telemedicine is essential, warranting further extensive research.

Globally, STIs are a serious public health issue, especially among youth in lower-income countries like Ghana. A 2019 study evaluated how teenagers and young adults use mobile phones for education and STI prevention. The findings suggest a strong belief in mobile apps over texts or calls for comfort and effectiveness in STI prevention among young adults [21].

In Germany, between 2019 and 2022, the "Intimarzt" project allowed patients to anonymously receive photo-diagnoses of external genital conditions from remote dermatologists and venereologists. This paid service used anonymization to protect against cyber risks. Doctors reported 90% success in remote diagnoses, and patient feedback on the app was positive [22].

Issues that telemedicine solves in STIs

Telemedicine in the diagnosis and treatment of STIs is a growing field. In 2019, the IDSA (Infectious Diseases Society of America) issued a statement expressing a positive opinion about the use and development of telemedical technologies in the treatment of sexually transmitted infections [23]. This is because telemedicine can address several issues associated with diagnosing and treating patients with STIs.

In Poland, the medical ethics committee currently views personal interactions as the ideal form of doctor-patient relationships, according to the Resolution of the Presidium of the Supreme Medical Council of 24 July 2020. While teleconsultations are increasingly common and recommended for managing chronic conditions, they are not advised at the moment for new patients or those with new health issues. Relying solely on teleconsultations for diagnosis and treatment is not recommended.

Shame barrier

One of the significant barriers preventing an STI patient from seeking treatment is the shame they may feel about visiting a healthcare provider and the fear of stigmatization or even discrimination due to the disease [5, 24–27]. A meta-analysis published in 2016, which analysed data from 125 studies, revealed that one of the main reasons for not initiating or discontinuing ART (antiretroviral therapy in HIV treatment) was fear of stigmatization and concern about a lack of discretion during treatment.

About 13% of adults and 40% of teenagers harboured these fears [28].

A solution that may alleviate the aforementioned difficulties is diagnosing STI patients using telemedicine tools. An option exists for patients to independently collect biological material at home for STI testing and to send the sample to the laboratory. This process is remotely controlled by the clinic, including qualification for the examination and follow-up [6]. Thanks to virtual visits, patients can feel more at ease and avoid situations in which they might be recognized by family or acquaintances. In the safe environment of their own home, patients can freely discuss sensitive health issues with a dermatologist, which can lead to more effective diagnosis and treatment [29].

This also provides a space where patients can mitigate feelings of shame and sidestep discrimination. Moreover, collecting test samples at home may be less embarrassing than a visit to a clinic [30–32]. Studies suggest that self-collected vaginal samples and other STI tests taken at home are not only more convenient to obtain but also match the accuracy of those collected by healthcare providers [33–36]. Furthermore, patients typically favour the convenience and privacy of at-home testing over clinic-based methods [37]. A blended strategy, which merges the ease of at-home testing with the support of follow-up teleconsultations, shows great promise in revolutionizing STI diagnosis. Nonetheless, comprehensive studies are essential to further investigate and effectively implement this innovative, hybrid methodology.

Availability of medical facilities and specialists

Another challenge STI patients may face is the availability of medical facilities and the problems associated with traveling to these centres, especially for those residing in smaller towns [24, 25]. The literature delineates the difficulties encountered by HIV patients living in small villages in the US [38, 39].

In the Alentejo province of Portugal, known for its sparse population, patients also grapple with challenges in accessing specialists due to required travel over long distances. In 1998, a system utilizing telemedical methods was introduced. Necessary equipment, along with a system enabling video calls to specialized centres, was installed in primary healthcare centres located near smaller towns. Instead of traversing long distances to a specialized facility, the patient could make a brief journey to the primary care centre. There, with the assistance of the facility's staff or primary care doctor, they could engage in a consultation with a specialist via a video call. Only if necessary, following such a televisit, would they be referred for a traditional visit to the specialist. Between 1998 and 2011, approximately 130,000 services were provided using this system, with teledermatology

constituting over 1/3 of all consultations. This model notably reduced the average distance patients needed to travel from around 50 km to 6 km [40]. The outlined system demonstrates that introducing telemedicine into diagnostics, even utilizing a model where the patient must reach the primary care centre, significantly mitigates travel-related issues. In contemporary models, patients do not have to depart from their homes for a teledermatology consultation, thus eliminating the need to travel to a centre [9].

Consequently, for those requiring STI diagnosis and treatment, who also encounter difficulties accessing facilities, telemedicine appears to be an effective solution [9, 40, 41]. This issue is particularly pronounced in third-world countries where many patients lack access to fundamental healthcare [42–44]. Implementing telemedicine for STI treatment in these regions seems to be a promising solution. In some instances, it may be the only opportunity for local patients to receive medical care [45]. However, it is imperative to note that the implementation of telemedicine in these countries encounters substantial barriers, such as lack of internet access, poverty, and cultural factors [46, 47]. Additionally, teledermatology offers a solution to the problem of specialist and medical equipment availability in healthcare. For instance, a dermatology specialist might employ teledermoscopy [48] or teleultrasonography [49] in the remote diagnosis of skin changes, including those suspected of carcinogenesis. Furthermore, telediagnosics of melanocytic skin tumours have achieved a diagnostic accuracy of 83% compared to conventional histopathological diagnostics [50]. These methods may serve as promising tools for swift diagnoses and decisions regarding the prioritization of referring patients for histopathological examinations, as well as monitoring diseases and treatment efficacy for various dermatoses, including those in the STI group.

Costs

In the literature, there are premises suggesting that telemedicine may contribute to reducing costs for medical facilities. A retrospective analysis conducted in the USA in 2017 compared the care and cost of teleconsultations with in-person visits across various medical facilities. The study's results indicated significantly lower costs for virtual visits while maintaining a similar level of healthcare, tests, and subsequent patient visits [51]. However, a year later, Shi *et al.* conducted a study, the results of which suggest a reduced quality of virtual visits compared to in-person visits, with fewer ordered laboratory tests and more frequent subsequent patient visits [52].

Many studies indicate that telemedicine may contribute to reducing healthcare costs, but further work is needed to provide more concrete and unambiguous evidence on this matter [53, 54].

The 2021 meta-analysis reviewed eight studies over the past decade comparing teledermatology control visit costs to traditional visits. It found that teledermatology significantly cuts patient costs compared to in-person visits [55]. It was also observed that patients paying for parking at medical facilities are more inclined to use online consultations, unlike patients who have access to free parking [56]. Based on studies on online consultations and follow-up visits, it can be concluded that telemedicine reduces patient costs [57].

Another beneficial aspect for the patient is time savings. Telemedical visits allow for the shortening of both the visit itself and travel to the facility [55, 57–60]. Concurrently, it enables doctors to increase the number of patient visits within a specific time frame.

Compliance

Also, another crucial aspect to consider is compliance. Highlighting this, the 2023-published study by Abeck *et al.*, showed a high 85.5% treatment adherence rate. This was the first study worldwide to examine data on treatment adherence in direct-to-consumer teledermatology. Notably, this research demonstrated that patient compliance remained robust even in the absence of traditional doctor-patient interactions [61].

Telemedicine threats in STI diagnostics

The development of telemedicine brings numerous benefits but also poses risks. On one hand, telemedicine enhances access to health services, expedites diagnostics, and improves the organization of medical facilities. Conversely, it may lead to an excessive dependence of doctors on new technologies, a progressive reduction of medical staff competencies due to immediate access to knowledge, and a limitation of personal doctor-patient contacts, potentially worsening the mental condition of the latter [62]. Recently, there have been propositions that telemedicine should not only facilitate contact between medical personnel and patients through appropriate applications but also incorporate popular social media platforms such as Facebook and Instagram [63]. These trends intensified during the COVID-19 global epidemic when social media became vital information channels for people infected with the SARS-CoV-2 virus [64]. In contrast, alarming studies highlight increasingly frequent and costly leaks of medical data in the virtual space, resulting from hacker attacks, theft, or improperly deleted, yet sensitive patient data [65].

Telemedicine's role in STI prevention and diagnosis is set to grow. Yet, data breaches are a critical concern as many STI patients also face depression [66] and a leak could worsen their mental health. The growing use of telemedicine for sexual health issues [67], which shows promise [68] underscores the need for robust data protection.

Effective telemedicine for STI diagnosis is hindered by poor internet and limited access to devices among low-income and minority families, particularly in rural areas [69, 70]. It is important to ensure that telemedical services are accessible to all segments of the society.

Another concern is that digitally adept younger people readily embrace new technologies, while older adults often need user-friendly, intuitive telemedical apps [71]. Patients used to in-person care often distrust digital healthcare solutions [72]. It is vital to assist these individuals in overcoming their reluctance to embrace new technologies.

The rise of telemedicine could strain the doctor-patient bond. Lack of in-person care may depersonalize doctors in the patient's eyes and erode their trust, potentially diminishing cooperation and satisfaction with treatment [73]. The therapeutic power of touch, which strengthens the patient's trust toward the doctor and allows for overcoming physical and emotional barriers between both parties, should also not be underestimated, which is unfortunately impossible in the case of telemedical means [74]. However, if a teleconsultation is necessary, the doctor should ensure appropriate conditions such as lack of screen distractors, pastel colours in the surroundings, proper attire, etc., to support the building of a bilateral relationship based on mutual trust [75].

Telemedicine and STIs amid the COVID-19 global epidemic

In the pre-COVID era in the United States, there was a steady increase in the incidence of STIs, including chlamydia, gonorrhoea, and syphilis [76]. Regrettably, the COVID-19 global epidemic significantly limited access to STI diagnostics due to the substantial burden the healthcare system experienced, caused by patients with severe cases of SARS-CoV-2 [77]. Additionally, visits to clinics specializing in STI treatment witnessed a significant drop, partly due to patients' fear of contracting the COVID-19 virus [78]. This dynamic significantly increased the demand for so-called HIV self-tests and kits for self-sampling, which patients would then send to laboratories for diagnostic testing for gonorrhoea, syphilis, and chlamydia [6]. On the other hand, due to the quarantine requirements for infected individuals and COVID restrictions, sexual contacts were limited, which might have helped curb the transmission of STIs [79]. Owing to numerous variables that could impact both the diagnosis and transmission of STIs, the precise influence of the global epidemic on the epidemiology of sexually transmitted infections remains controversial.

In various countries, due to the declaration of an epidemic state, the prevalence of diagnosed STI cases changed significantly over time. In Sweden in 2020, there was a notable decrease in the occurrence of confirmed cases of chlamydia and gonorrhoea compared

to the previous year, as well as a significant decrease in the frequency of testing for these infections. This was partly compensated by patients self-sampling for tests [80]. Similarly, in Greece in the same year, the number of diagnosed cases of gonorrhoea and syphilis decreased compared to the previous year [81]. These results contrast with those obtained in Chicago, United States, where an increase in syphilis incidence was observed in the first three months of the COVID-19 global epidemic, despite maintaining the pre-epidemic frequency of diagnostic testing [79]. Ultimately, data from the American Centers for Disease Control and Prevention indicate that in the early COVID-19 global epidemic period, there was a global decrease in confirmed cases of chlamydia and gonorrhoea, while there was an increase in diagnosed syphilis cases. However, in 2020 as a whole, there was a decrease in the detectability of chlamydia and syphilis, whereas no change was observed for gonorrhoea compared to 2019 in the United States [82].

In contrast, in 2021, there was an increase in diagnosed cases of gonorrhoea, and primary and secondary syphilis, which may be attributed to the reopening of many medical facilities dealing with the diagnosis and treatment of STIs, and potentially increased transmission of these infections due to the lifting of some regulations limiting human contact [83].

During the turbulent period of the COVID-19 global epidemic, teledermatology became an essential tool in the hands of medical staff. Considering that the burden of care for patients infected with SARS-CoV-2 shifted to hospitals, access to specialists was significantly limited. Therefore, the American Academy of Dermatology recommended the use of telemedicine to differentiate between conditions requiring urgent dermatological intervention and those that did not [84]. This strategy might have, to some extent, contributed to reducing waiting times for dermatologists and shortened the path from diagnosis to treatment [85].

The 2019 study among Polish dermatologists highlighted scepticism towards replacing in-person consultations with digital telemedicine tools, citing a heightened risk of medical errors [86]. Concurrently, a survey during the first year of the COVID-19 pandemic revealed a similar reluctance from patients, who doubted telemedicine's effectiveness in adequately assessing skin lesions. This scepticism was underscored by the fact that 96.6% of dermatologists needed additional in-office visits or extra pictures due to unclear clinical images [87]. Another study during the pandemic on the Polish population echoed these concerns, noting the fear of missing serious illnesses without direct contact. However, it also indicated a growing acceptance of telemedicine [88]. This underscores the importance of mutual consent in telemedicine to maintain trust between patient and doctor [89]. In contrast, a retrospective analysis in Germany in 2021–2022 showed positive outcomes, with most teledermatology patients reporting

treatment success and satisfaction, thereby easing the strain on outpatient clinics [90].

Conclusions

Teledermatology has the potential to enhance access to medical services, expedite STI diagnostics, and reduce waiting times for consultations. Furthermore, its utilization for rendering more specialized diagnoses, as well as for the prevention and treatment of sexually transmitted infections, appears promising. Concurrently, it is imperative to contemplate the risks associated with teledermatology, which encompass the absence of direct patient-doctor interaction, the potential diminution of the medical staff's soft skills, and threats to data security in the virtual domain. During the COVID-19 global epidemic, numerous healthcare facilities reduced their services, necessitating adjustments in teledermatology regulations and thereby accelerating its development. Nonetheless, further research involving substantial patient groups is essential to thoroughly evaluate the effectiveness of this technology. The establishment of clear and transparent guidelines for telemedicine, including teledermatology, is paramount to ensure legal protection for both patients and healthcare professionals [91].

Limitations

This narrative review may be subject to selection bias due to its reliance on a selective range of literature and the inherent subjectivity in interpreting findings in the rapidly evolving field of teledermatology. Furthermore, the review's lack of quantitative data and its limited discussion on the technology and ethics of teledermatology also limit its overall thoroughness.

Conflict of interest

The authors declare no conflict of interest.

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