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FEASIBILITY OF DIGITAL COLPOSCOPY USING SMARTPHONES: LITERATURE REVIEW AND PROPOSAL FOR APPLICATION IN PRIMARY CARE

VIABILIDADE DA COLPOSCOPIA DIGITAL COM SMARTPHONE: REVISÃO DA LITERATURA E PROPOSTA DE APLICAÇÃO NA ATENÇÃO PRIMÁRIA

VIABILIDAD DE LA COLPOSCOPIA DIGITAL CON SMARTPHONE: REVISIÓN DE LA LITERATURA Y PROPUESTA DE APLICACIÓN EN LA ATENCIÓN PRIMARIA

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ABSTRACT

Cervical cancer remains an important cause of illness and death among women, especially in settings with limited access to diagnostic services. In many health systems, the main bottleneck is not the screening test itself, but the availability of colposcopy, which is often concentrated in a few reference centres with a small number of specialists and devices. The rapid evolution of smartphone cameras offers a concrete opportunity to obtain high-quality images of the uterine cervix directly in primary care. This article describes an experiment using a state-of-the-art smartphone camera to perform digital colposcopy and compares the findings with those obtained using a conventional colposcope. In a pilot study, images obtained with the smartphone showed more than 95% agreement with the standard exam in lesion classification and biopsy indication, suggesting that the mobile device can work as a useful diagnostic support tool. The text discusses how these images can be integrated into telemedicine workflows, analysed by reference professionals and, in a subsequent stage, processed by artificial intelligence algorithms to refine risk assessment. By bringing diagnostic resources closer to women living in remote or underserved areas, this strategy aims to accelerate early detection, reduce delays between screening and treatment and contribute to lowering cervical cancer mortality.

Keywords: Cervical Cancer. Colposcopy. Smartphone. Digital Health. Artificial Intelligence. Telemedicine.

RESUMO

O câncer do colo do útero segue entre as principais causas de morte por neoplasias em mulheres brasileiras, mesmo sendo amplamente prevenível por meio do rastreio organizado e do tratamento das lesões precursoras. Um dos grandes gargalos está no acesso à colposcopia, especialmente em regiões remotas e em serviços com poucos especialistas e equipamentos, o que atrasa a confirmação diagnóstica e o início da terapia. A popularização de smartphones com câmeras avançadas abre uma via concreta para registrar imagens de

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alta definição do colo uterino em unidades básicas de saúde. Este artigo descreve uma experiência com uso da câmera de um smartphone de última geração, para realização de colposcopia digital e compara os achados com o exame realizado com colposcópio convencional. Em estudo piloto, a concordância entre os dois métodos ultrapassou 95% na classificação das lesões e na indicação de biópsia, sugerindo que o dispositivo móvel pode funcionar como ferramenta de apoio ao diagnóstico. O texto discute ainda como essas imagens podem ser compartilhadas em rede, avaliadas por especialistas à distância e, em uma etapa seguinte, processadas por algoritmos de inteligência artificial, ampliando a precisão diagnóstica. Ao aproximar o exame da realidade das equipes de atenção primária, a proposta busca contribuir para diagnóstico mais ágil, redução de iniquidades e diminuição da mortalidade por câncer do colo do útero.

Palavras-chave: Câncer do Colo do Útero. Colposcopia. Smartphone. Saúde Digital. Inteligência Artificial. Telemedicina.

RESUMEN
El cáncer de cuello uterino sigue siendo una causa importante de morbilidad y mortalidad en mujeres, sobre todo en regiones con dificultades de acceso a servicios diagnósticos. En muchos contextos, el principal cuello de botella no está en la prueba de cribado, sino en la colposcopia, que suele concentrarse en pocos centros de referencia con número limitado de especialistas y equipos. El avance de las cámaras de los teléfonos inteligentes abre una posibilidad concreta de obtener imágenes de alta definición del cuello uterino en el propio nivel de atención primaria. Este artículo describe una experiencia con el uso de la cámara de un smartphone de última generación para realizar una colposcopia digital y compara los resultados con los obtenidos con un colposcopio convencional. En un estudio piloto, las imágenes obtenidas con el teléfono mostraron una concordancia superior al 95 % con el examen estándar en la clasificación de las lesiones y en la indicación de biopsia, lo que sugiere que el dispositivo móvil puede funcionar como herramienta de apoyo diagnóstico. El texto también aborda la integración de estas imágenes en circuitos de telemedicina, su lectura por profesionales de referencia y el uso posterior de algoritmos de inteligencia artificial para refinar la estratificación de riesgo. Al acercar los recursos diagnósticos a mujeres que viven en zonas remotas o con servicios limitados, esta propuesta busca agilizar la detección temprana, acortar el intervalo entre cribado y tratamiento y ayudar a reducir la mortalidad por cáncer de cuello uterino.

Palabras clave: Cáncer de Cuello Uterino. Colposcopia. Teléfono Inteligente. Salud Digital. Inteligencia Artificial. Telemedicina.

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1 INTRODUCTION

Cervical cancer still occupies an important position among the diseases that most affect women in Brazil, especially in regions of greater social vulnerability. Even with the HPV vaccine and screening programs already consolidated, many cases continue to be diagnosed in advanced stages, which increases the need for aggressive treatments and the risk of death. Official data show that the burden of this neoplasm remains high, especially in the North and Northeast, which points to concrete flaws in the line of care that ranges from prevention to follow-up of altered exams (National Cancer Institute, 2022).

The screening model organized in the country progressively combines oncotic cytology and HPV DNA testing, in search of greater sensitivity and better organization of supply. In theory, this arrangement would make it possible to identify precursor lesions in an appropriate time, plan less invasive approaches, and reduce the occurrence of invasive cases. In the routine, however, national studies show that there are still many points of loss between the collection, reading, delivery of results and referral of women for colposcopic evaluation in a reasonable time (Migowski, 2025).

Among all the steps along this path, colposcopy is usually the weakest point, especially in the public network. In several services, there are few trained professionals, the equipment is restricted to larger hospitals and the schedules meet the demand of several municipalities. A study carried out in a Brazilian hospital revealed a large volume of referrals with correct indication, but also relevant delays between the result of the cytological examination and the performance of colposcopy, with a real risk of abandonment and loss to follow-up (Carvalho, 2020).

When you look at the territory, the difficulty becomes even clearer. Women living in rural areas, urban peripheries, or small towns often rely on long commutes, irregular transportation, and overhead costs to access services that perform colposcopy. A recent study on screening in the country reinforces that these logistical and social barriers directly influence non-attendance and help maintain regional inequalities in cervical cancer incidence and mortality indicators (Guimarães, 2025).

While these difficulties persist, the daily life of health services has changed a lot with the diffusion of digital tools. High-performance smartphones have become part of clinical practice, serving to record images, exchange information between teams, and support decisions remotely. Analyses on the use of digital technologies show that mobile devices are already used in several areas of medicine as a low-cost alternative for documentation and

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to support diagnostic imaging, opening space for creative solutions in the public network (Pedroso, 2024).

In women's health, a line of investigation that has been gaining strength is the use of artificial intelligence applied to cervical imaging and oncotic cytology. Brazilian researchers describe models capable of assisting in screening, suggesting risk categories, and reducing variability among professionals, as long as they receive good quality images and follow strict validation protocols. This combination of image banks and machine learning algorithms emerges as a promising resource for reorganizing tracking on a large scale (Oliveira, 2025).

The project that gives rise to this article arises exactly from the junction between these needs and possibilities. The central idea is to test whether the camera of a high-end smartphone, such as the Samsung S24, can record images of the cervix with sufficient quality to allow colposcopic evaluation comparable to that made with a traditional colposcope. In a pilot study under development, the agreement between the two methods exceeds ninety-five percent in the classification of lesions and in the indication of biopsy, which suggests a concrete way to expand access to diagnosis at different points in the network (Freire, 2025).

This proposal dialogues with recent changes in national guidelines, which recommend greater use of HPV DNA tests, reorganization of flows, and progressive incorporation of digital technologies in cervical cancer screening. A report by the national commission responsible for evaluating new technologies in the SUS highlights that any model transition needs to consider both laboratory capacity and strategies that facilitate the follow-up of women with altered exams, including telemedicine and portable solutions that can be applied in primary care (Conitec, 2024).

Although this study is predominantly a literature review, part of the analysis is based on preliminary data from a pilot study entitled "Colpo Scanner – Transforming the Diagnosis of Cervical Cancer with Accessible Technology", submitted to the Research Ethics Committee of the Faculty of Medicine of Campos (CAAE: 89888425.3.0000.5244).

The initial results suggest an agreement of more than 95% between images obtained with a high-resolution smartphone and conventional colposcopy in the classification of lesions and indication for biopsy. These findings are presented in an exploratory manner and illustrate the potential of the strategy in the context of primary care.

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2 THEORETICAL FRAMEWORK

2.1 CERVICAL CANCER, SCREENING, AND ACCESS TO COLPOSCOPY

Cervical cancer is recognized as a disease strongly related to persistent infection by oncogenic types of the human papillomavirus, with a slow trajectory, marked by pre-invasive phases that can be detected and treated before progression to invasive disease. This characteristic makes it one of the classic models of neoplasm that can be controlled by screening, provided that the target population is reached in an organized manner and that the follow-up of women with abnormal tests is guaranteed over time (National Cancer Institute, 2022).

In Brazil, the construction of policies for this condition has taken place, for decades, with an almost exclusive focus on oncotic cytology, carried out on a large scale in primary care, with recommendations for age groups and well-defined intervals. In recent years, the debate has begun to incorporate HPV DNA testing as a method of greater sensitivity, with modeling studies and field experiences pointing to advantages in terms of early detection and the possibility of extending the interval between calls, as long as the follow-up flow is well designed (Migowski, 2025).

Demonstrations in Brazilian populations have explored precisely this transition, evaluating the performance of HPV DNA in screening, the impact on the identification of precursor lesions, and the readjustment of follow-up protocols. In a population-based study, conducted in public health services, the adoption of molecular testing was associated with greater detection of high-grade lesions and a redesign of the line of care, with a focus on structured recall and clear criteria for referral for complementary tests (Teixeira, 2023).

Even with advances in screening, the link that connects screening and treatment continues to be colposcopy, an exam that allows detailed evaluation of the cervix and definition of biopsy points. Descriptions of Brazilian services show, however, that referrals for colposcopy do not always translate into timely care. In a reference hospital analyzed by researchers in the area, high volumes of requests, delays in scheduling, and a significant fraction of women who did not get to take the exam were observed, revealing important access failures (Carvalho, 2020).

These faults are not distributed homogeneously throughout the territory. Recent analyses of screening in the country indicate that regional inequalities, transportation barriers, low education, and social vulnerability directly interfere with a woman's chance of

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completing the journey between the initial exam, colposcopy, biopsy, and treatment, even when she lives in an area covered by primary care (Guimarães, 2025).

Another point that appears in the literature is the coexistence of precursor lesions with other sexually transmitted infections, which reflects contexts of accumulated risk. A study with Brazilian women with precancerous cervical lesions identified a high frequency of associated infections, reinforcing the need for a comprehensive approach to sexual health, opportunistic screening, and dialogue between infection prevention actions and cervical cancer control policies (Follador, 2025).

The theoretical discussion on the subject converges on the idea that it is not enough to improve screening if the test that guides the conduct remains restricted, with long lines and little capillarity. In this sense, there is growing interest in strategies that facilitate access to cervical assessment, either through the standardization of colposcopic scores or through the search for solutions that make the test more portable and feasible in units with fewer technological resources (Campos, 2022).

2.2 DIGITAL HEALTH, SMARTPHONES, AND ARTIFICIAL INTELLIGENCE IN CERVICAL DIAGNOSIS

The recent advance of digital health in the country has brought to the center of the debate the possibility of using information and communication technologies to support diagnosis, monitoring and organization of care networks. In particular, systems based on medical images have benefited from the convergence between affordable hardware and algorithms capable of recognizing complex patterns, which has been the subject of reviews that discuss the performance of artificial intelligence models in different fields, such as radiology, dermatology, and other areas in which visual evaluation is central (Pedroso, 2024).

Within this broader scenario, smartphones emerge as versatile tools for recording clinical images. Devices with high-resolution cameras, stabilization, and magnification capabilities have become commonplace in daily practice, and several groups have started to use these devices for both case documentation and research. In the field of cervical cancer prevention, studies with Brazilian women also explore portable resources, such as autonomous collection of material for HPV genotyping, reinforcing the interest in solutions that combine practicality, lower cost, and greater territorial reach (Castanheira, 2025).

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Artificial intelligence applied to cervix-related exams appears, in recent national literature, as a frontier of innovation with strong potential for impact. Review on the use of algorithms in the reading of oncotic cytology discusses how neural networks can support slide screening, reduce manual workload, and reduce variability between cytotechnicians and pathologists, as long as validation criteria, continuous training, and qualified human supervision are respected (Oliveira, 2025).

Specifically in relation to cervical cancer, there are Brazilian studies that address the effect of artificial intelligence on early detection, gathering evidence on the ability of these systems to recognize patterns in cytological exams, HPV tests, and cervical imaging. In a recent review, it is highlighted that the use of computer models, when associated with well-organized screening flows, can contribute to identifying high-grade lesions in early stages, improving the use of specialized resources, and supporting decision-making in clinical practice (Freire, 2025).

The use of digital technologies also needs to dialogue with other control strategies, such as HPV vaccination, which modifies the risk profile of populations over time. A study with young Brazilian women evaluated the effectiveness of immunization in reducing infection by oncogenic types, contributing to the understanding of how the combination of vaccine, organized screening, and diagnostic methods supported by technology can change the burden of disease in the medium and long term (Santos, 2025).

3 METHODOLOGY

This research was organized as a descriptive and analytical bibliographic research, built from the reading and research of scientific productions on cervical cancer, screening, digital colposcopy, use of smartphones and artificial intelligence in women's health. The option for literature review seeks to gather scattered evidence in articles, guidelines, and technical reports, creating an articulated framework that supports the discussion on the feasibility of colposcopy with a cell phone camera in public health care contexts (Migowski, 2025).

Although this study is predominantly a literature review, part of the discussion is based on preliminary results of a pilot study conducted by the author, still in the systematization phase, which indicated an agreement of more than 95% between digital colposcopy with a smartphone and conventional examination. Such data are presented in a descriptive way, without the intention of statistical generalization."

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The search for information included electronic databases widely used in health, with emphasis on PubMed, SciELO and Google Scholar, complemented by consultation of institutional documents and reports from agencies responsible for health technology assessment in Brazil. This combination allows for both original studies and reviews as well as official recommendations on the organization of screening, care flows, and the incorporation of digital solutions into the public system (Conitec, 2024).

Descriptors in Portuguese and English related to the central axes of the theme were defined, such as "cervical cancer", "screening", "colposcopy", "smartphone", "artificial intelligence" and "digital health", adjusted according to the vocabularies of each database. These terms were used alone and in combination with Boolean operators, seeking to recover productions that addressed both the traditional colposcopic examination and experiences of using mobile technologies and computational algorithms applied to cervical diagnosis (Oliveira, 2025).

As inclusion criteria, articles published between 2020 and 2025, available in full, in Portuguese, English, or Spanish, with preference for studies conducted in Brazil or that presented data and discussions applicable to the reality of middle-income countries, were considered. Technical documents and national guidelines related to cervical cancer control were also included, as long as they brought relevant information for understanding the organization of screening and access to diagnosis (Teixeira, 2023).

Studies with an exclusive focus on non-cervical gynecological neoplasms, studies with a pediatric or male perspective, theses and dissertations without a journal version, congress abstracts without full text, and publications that only mentioned the use of cell phones in a superficial way, without clear data on image quality, diagnostic performance, or implications for clinical practice, were excluded. After applying these filters, the titles and abstracts were read to select the materials potentially eligible for complete analysis (Guimarães, 2025).

The next stage consisted of the full reading of the selected texts, with systematic extraction of information in a spreadsheet prepared for this purpose. Data such as year of publication, country of conduction, type of study, population involved, screening or diagnosis method used, presence or absence of digital colposcopy, use of smartphones, use of artificial intelligence algorithms, and main results related to accuracy, feasibility, and implications for health services were recorded (Freire, 2025).

Elements related to the methodological quality of the studies were also observed, such as clarity of the inclusion criteria, description of the participant selection process,

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definition of outcomes, and form of statistical analysis. In the case of studies that evaluated colposcopy or classification of cervical findings, it was verified whether standardized scores were used and whether the examiners had documented formal training, which directly influences the interpretation of the results and the possibility of comparison between different investigations (Campos, 2022).

To organize the research, the works were grouped into thematic blocks: production on tracking and organization of the line of care; studies on the use of HPV DNA tests and model transition; publications that address colposcopy and proposals for digital or portable colposcopy; and texts specifically aimed at artificial intelligence applied to cervical exams. Each block was discussed in an articulated way, highlighting convergences, divergences, and gaps that deserve attention in future research and in the practice of services (Lima, 2023).

As this is a bibliographic research, without data collection directly from patients or professionals, there was no need to submit to a research ethics committee, although the principles of scientific integrity were respected, with adequate citation of sources and care in the interpretation of findings. The possible limitations are the dependence on materials available in the chosen databases, the exclusion of part of the gray literature, and the concentration in a recent time frame, although this focus is consistent with the intention of dialoguing with the current state of policies and technologies aimed at the control of cervical cancer (National Cancer Institute, 2022).

The selected studies were organized into four thematic blocks: (1) tracking and organization of the line of care; (2) HPV DNA testing and alternative models; (3) proposals for digital or portable colposcopy; and (4) applications of artificial intelligence in cervical diagnosis. This categorization allowed a structured analysis of the evidence, highlighting convergences, gaps, and practical implications for health services, as shown in Figure 1.

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Figure 1

Thematic categorization of the studies included in the review

Categoria Temática	Foco dos Estudos	Principais Referências
1. Rastreamento e linha de cuidado	Barreiras no percurso entre triagem e diagnóstico confirmatório; desigualdades regionais	Guimarães (2025); Carvalho (2020); INCA (2022)
2. Testes de DNA do HPV e modelos de rastreio	Efetividade do HPV-DNA; vantagens sobre citologia; impacto em protocolos assistenciais	Migowski (2025); Teixeira (2023); Lima (2023)
3. Colposcopia digital e uso de smartphones	Experiências com registro de imagens cervicais com dispositivos móveis; viabilidade técnica e aplicabilidade	Campos (2022); Castanheira (2025); Freire (2025)
4. Inteligência artificial aplicada ao diagnóstico cervical	Aplicações em citologia e colposcopia; algoritmos para triagem; apoio à decisão clínica	Oliveira (2025); Pedroso (2024); Freire (2025)

Source: Prepared by the author based on the studies included in the review (2020–2025).

4 RESULTS AND DISCUSSIONS

The literature review showed, first, that the current debate on cervical cancer control in Brazil revolves around the reorganization of screening, the incorporation of HPV DNA testing, and the need to reduce the distance between screening and confirmatory diagnosis. Several texts analyzed reinforce that the slow natural history of the disease would create a good opportunity for intervention, but the way the services are structured still prevents this biological advantage from translating into fewer invasive cases in the day-to-day life of the services (Migowski, 2025).

The epidemiological documents and official reports consulted converge in showing that the burden of cervical cancer remains high, with a strong concentration in lower-income regions, even after years of offering oncotic cytology in the basic network. This indicates that it is not just a lack of test, but a combination of low useful coverage, failures in the quality of collection, delay in the release of reports, and difficulties in completing the path to colposcopy and biopsy when there is a higher risk change (National Cancer Institute, 2022).

Among the studies that describe the line of care, those that detail the path of women to colposcopy stand out, evidencing the exam as a critical point. In the Brazilian service analyzed, important rates of non-attendance and delays in performing the procedure were observed, even among women appropriately referred through cytology, which helps to

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understand why pre-invasive lesions still evolve to more serious conditions in the twenty-first century (Carvalho, 2020).

The articles that focus on health inequalities highlight that these obstacles are even more accentuated when looking at specific territories. Residents of rural areas, urban peripheries, and small municipalities face long trips, indirect costs, and difficulties in reconciling appointments with family responsibilities, which increases the chance of abandonment of follow-up and delay in diagnostic confirmation. These analyses reinforce the need for solutions that bring the confirmatory test closer to where women live, instead of concentrating everything in a few centers (Guimarães, 2025).

Another recurring point in the literature is the association between precursor cervical lesions and other sexually transmitted infections. Studies with Brazilian women treated in specialized services show a high frequency of concomitant infections, which suggests a context of increased vulnerability and indicates that cervical cancer prevention needs to go hand in hand with a comprehensive approach to sexual and reproductive health, including testing, counseling, and access to protective supplies (Follador, 2025).

In parallel with the discussion on screening, a significant part of the studies analyzed focuses on the transition from the cytology-centered model to arrangements that place the HPV DNA test as the main axis. National studies indicate that this type of examination tends to increase the detection of high-grade precursor lesions and allows for lengthening screening intervals, as long as there are well-defined flows for the follow-up of women with a positive result, with special attention to those who live in remote areas (Teixeira, 2023).

Some of these studies draw attention to the fact that the adoption of HPV DNA, by itself, does not solve the colposcopy bottleneck. In practice, the number of women who need complementary evaluation increases, which can put even more pressure on the schedules of already overloaded services. The national literature indicates that any change in the screening method needs to be accompanied by strategies to expand diagnostic capacity and rationalize referrals, at the risk of creating even longer waiting lists (Lima, 2023).

The recent technical reports of the commission responsible for assessing health technologies in the country reinforce this reasoning, arguing that innovations in tracking should be integrated into organized care networks, with a clear definition of roles between primary care, diagnostic support services, and referral units. The documents analyzed suggest that digital tools and portable solutions can help precisely in the confirmation stage,

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as long as they are incorporated in a planned way and with quality guarantees (Conitec, 2024).

In this context, the reviewed materials on digital health show a broad movement towards the incorporation of information technologies into clinical practice. Reviews on artificial intelligence and diagnostic imaging describe how algorithms have been applied to radiographs, CT scans, dermatological exams, and other forms of imaging, with encouraging results in terms of accuracy and agility, even though they require important ethical and regulatory care (Pedroso, 2024).

In the specific field of oncotic cytology and cervical exams, Brazilian texts show the emergence of artificial intelligence models capable of supporting slide screening, suggesting risk categories, and reducing variations among observers, which can contribute to a more rational use of the specialized workforce. In these analyses, it is clear that the quality of the digitized images or slides is decisive for the performance of the algorithms, which puts on the agenda the need for good practices in the capture and processing of records (Oliveira, 2025).

The studies that directly address the impact of artificial intelligence on the early detection of cervical cancer reinforce this same idea: well-trained algorithms can work as a second reading, identify discrete patterns of alteration, and support decisions in screening and follow-up, as long as they are inserted in well-designed clinical flows and accompanied by human supervision. Literature reviews point to potential gains in reducing false negatives and prioritizing cases that need faster evaluation (Freire, 2025).

Alongside these advances in artificial intelligence, the review identified studies that explore collection or recording strategies that are closer to the reality of users. Research on self-collection for HPV genotyping shows that many women feel more comfortable with methods that require less body exposure, and that these resources, when well guided, can increase the coverage of populations that hardly attend the traditional gynecological examination, which signals openness to other innovations that take advantage of portable technologies (Castanheira, 2025).

Epidemiological reports consulted reinforce that, even with the gradual introduction of HPV vaccination, the country will live for years with generations that were not immunized at the ideal age, which requires maintaining and improving screening and diagnosis. The available data indicate a reduction in infections in vaccinated groups, but do not eliminate

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the need for effective diagnostic confirmation strategies for women already exposed, which makes it even more urgent to discuss solutions to the colposcopy bottleneck (Santos, 2025).

The cancer planning and projection documents, produced in partnership between national institutions, reinforce that the future burden of cases and deaths will depend on the ability of the health system to combine vaccination, screening with more sensitive methods, and efficient organization of the line of care, with special attention to the regions that historically concentrate most cases. In these texts, the need for innovation is explicitly pointed out, always linked to the concrete reality of the public network (Ministry of Health; National Cancer Institute, 2022).

Within this broad framework, the idea of colposcopy with a smartphone analyzed in this review appears as a direct response to two problem axes: unequal distribution of colposcopes and lack of professionals available for face-to-face care. By gathering evidence on digital health, tracking, and flow organization, the literature provides a solid basis for arguing that a solution based on high-resolution camera and telemedicine can work as an extension of diagnostic capacity, provided that image capture standards and clear criteria for interpreting findings are established (Migowski, 2025).

The research of the findings shows that digital colposcopy with a smartphone fits well into HPV DNA-based screening models. Women who test positive could be called to the basic unit, where the professional performs an enlarged visual examination of the cervix with the cell phone supported by a simple support, generates photos in good definition and sends this material to a reference service. This arrangement shortens the path to specialized evaluation, reduces long trips and reschedules for face-to-face colposcopy, especially in regions that currently depend on few centers (Teixeira, 2023).

Studies on the organization of screening indicate that the analysis of images at a distance helps to reduce losses to follow-up, because part of the decisions are made based on what was recorded in the unit itself. In areas with a shortage of colposcopists, the same specialist can evaluate photos from various locations in a teleconsultation regime, expanding the reach of care. To maintain quality, the literature reinforces the importance of standardized reading criteria, such as colposcopic scores applied to photos captured by the smartphone, as long as sharpness and contrast allow for a good visualization of the changes (Oliveira, 2025).

The texts also remind us that any expanded use of digital colposcopy and artificial intelligence needs to go hand in hand with regulation, definition of responsibilities and

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protection of sensitive data. National reports on health technologies draw attention to the need to assess cost-effectiveness, establish clear rules for telemedicine and the use of personal devices and, at the same time, encourage local research that tests protocols with devices such as the Samsung S24 in the public network, generating evidence specific to the Brazilian context (Conitec, 2024).

The use of smartphones for digital colposcopy in clinical contexts requires strict attention to the General Data Protection Law (LGPD). It is essential to ensure informed consent, confidentiality in the transmission of images, and restricted access to authorized professionals. Safety protocols and ethical supervision must accompany every technological implementation in the public network.

5 CONCLUSION

Reading the set of studies and documents analyzed shows that cervical cancer control depends less on unpublished discoveries and more on the ability to organize what already exists: vaccination, screening with good coverage, rapid access to diagnostic confirmation, and timely treatment. Within this gear, colposcopy remains the centerpiece, but still surrounded by access barriers, long queues and concentration of resources in a few services. The proposal to use the camera of modern smartphones as a digital colposcopy tool arises precisely as a response to this fragile point, offering an alternative closer to the reality of primary care and the territories where women live.

The research presented indicates that there is fertile ground to integrate digital health, telemedicine, and artificial intelligence into the cervical cancer care line, as long as these technologies are thought of as support for teams and not as an isolated solution. The use of a device such as the Samsung S24 to record cervical images in high definition can expand diagnostic capacity in places without a colposcope, while remote analysis by experts and the support of algorithms help to qualify the interpretation of these images. When this combination is articulated with well-defined flows and public policies that prioritize historically excluded populations, space is opened to shorten the path between screening and diagnosis.

The incorporation of digital colposcopy with a smartphone requires care with professional training, ethics, data protection and continuous evaluation of results. More than just adapting protocols, it will be necessary to build pilot experiences in different regions, listen to users and health workers, measure the impact on waiting times and the proportion

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of cases detected in the initial phase. If these movements are conducted with planning and commitment to equity, pocket colposcopy is no longer just a promising idea and becomes part of a broader project to democratize women's health diagnosis.

The next steps should include multicenter studies with a larger number of participants, formal validation of the smartphone image criteria, and cost-effectiveness analysis of large-scale implementation. Collaboration between universities, primary care networks, and regulatory bodies will be essential to transform this innovation into sustainable and evidence-based public policy.

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