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Pediatric Teledermatology

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ABSTRACT: The COVID-19 pandemic significantly accelerated the adoption of pediatric teledermatology, which has proven beneficial in improving access to dermatologic care, particularly in underserved or rural areas. Pediatric teledermatology addresses unique challenges posed by children's dermatologic conditions, such as infantile hemangiomas, by enabling earlier diagnosis and treatment, such as initiating propranolol therapy. . Teledermatology bridges geographic gaps, reducing wait times and enhancing diagnostic accuracy through technological advancements in image quality. Despite some challenges with diagnostic precision in rural settings, teledermatology has demonstrated effectiveness in providing high-quality care, particularly when combined with traditional methods. This review synthesizes current literature on teledermatology's role in pediatric care, its effectiveness, and its role in expanding access to dermatological services.

I. INTRODUCTION

Teledermatology, a specialized application of telemedicine, has expanded significantly, encompassing synchronous (live video), asynchronous (store-and-forward), and hybrid models. These modalities allow remote diagnosis and management of various dermatological conditions, offering high diagnostic accuracy for conditions like atopic dermatitis, acne, and hemangiomas. Deferred teledermatology, particularly store-and-forward methods, is widely used for diagnostic accuracy and early treatment planning. It has proven instrumental in reducing wait times, enhancing collaboration between care levels, and fostering training and awareness in pediatric dermatology. However, limitations persist, particularly for severe or rare conditions like tumors, which often require in-person evaluation

Teledermatology, a subset of telemedicine, has transformed dermatological care by leveraging technology to provide remote diagnosis and management of skin conditions. This innovative approach addresses disparities in healthcare access, especially in underserved and rural areas, where the availability of dermatologists is limited. By utilizing digital platforms, high-resolution imaging, and telecommunication tools, teledermatology has proven effective in reducing wait times, improving patient satisfaction, and optimizing care delivery for common and complex dermatological conditions.
One of its most impactful applications is in pediatric dermatology, a field often constrained by a shortage of specialists. Teledermatology enables timely evaluation and management of conditions such as atopic dermatitis, infantile hemangiomas, and acne. Studies have shown high diagnostic concordance rates between teledermatology and in-person consultations, validating its clinical reliability. During the COVID-19 pandemic, teledermatology became a critical tool for maintaining continuity of care, further demonstrating its utility in managing chronic conditions remotely.

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Teledermoscopy, a specialized teledermatology application, enhances diagnostic precision by using dermoscopic images to evaluate skin lesions. It offers diagnostic accuracy comparable to face-to-face evaluations, making it invaluable for triaging suspicious lesions and monitoring chronic skin conditions. Particularly beneficial in resource-constrained settings, teledermoscopy enables early intervention while reducing unnecessary referrals and hospital visits.

Despite its advantages, teledermatology faces challenges such as technological barriers, digital literacy gaps, and concerns about data privacy. Addressing these issues requires robust infrastructure, patient and provider education, and adherence to standardized guidelines like those implemented in Australia. These guidelines ensure safe, efficient, and equitable teledermatology practices, paving the way for its broader adoption and integration into modern healthcare systems.

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Teledermatology's potential extends beyond clinical outcomes to economic and systemic benefits. It significantly reduces healthcare costs by minimizing travel expenses, optimizing resource utilization, and preventing unnecessary hospital visits. For healthcare systems, teledermatology enhances operational efficiency by streamlining referrals and reducing the burden on overextended specialists. Its adaptability across various care models, including store-and-forward methods, real-time consultations, and hybrid approaches, ensures that it can cater to diverse patient needs and healthcare settings. As teledermatology continues to evolve with advancements in technology, it is poised to become an integral component of comprehensive dermatological care worldwide.

II. LITERATURE SURVEY

Teledermoscopy has emerged as a vital tool for remote dermatological care, integrating dermoscopic imaging into teledermatology practices. Two primary approaches are highlighted in the literature: mobile teledermoscopy, using smartphones with dermoscope attachments for short-term monitoring and self-examinations, and digital teledermoscopy, employing advanced dermatoscopes in structured clinical settings. Studies demonstrate diagnostic concordance rates of 81% to 91% between teledermoscopy and face-to-face evaluations, highlighting its utility in underserved areas and its role in reducing no-show rates and surgical waiting times. Despite these benefits, challenges remain, including reduced accuracy in diagnosing complex lesions and limitations in screening for non-pigmented skin cancers.

The global shortage of dermatologists, particularly in rural areas, underscores teledermatology's importance in addressing healthcare disparities. By reducing travel burdens, wait times, and costs, teledermatology bridges the gap between patients and specialists. It has shown particular success in underserved regions, where limited access to care is a persistent issue. Studies confirm that teledermatology can maintain diagnostic accuracy (up to 97%) and provide timely triaging of urgent cases. However, challenges like inconsistent image quality, unreliable internet connectivity, and varying levels of digital literacy among patients and providers hinder its broader adoption.

Standardized guidelines, such as those in Australia, aim to address these limitations and ensure consistent quality of care. These guidelines emphasize critical aspects like patient selection, informed consent, privacy protocols, and high-quality imaging. By providing a structured framework, they support the integration of teledermatology into routine practice while mitigating medico-legal risks. Collectively, the literature underscores teledermatology's transformative potential to complement traditional dermatological care, while highlighting the need for ongoing research and advancements to overcome existing challenges.

The store-and-forward (SF) teledermatology model aimed to improve access to pediatric dermatologic care, addressing the shortage of specialists. It enabled efficient remote management of cases, earning high satisfaction from pediatricians and parents. However, limitations included lower diagnostic confidence for conditions like alopecia, pigmented lesions, and warts, as well as challenges with image quality affecting accuracy. Recommendations focused on improving photo quality and referring complex cases for in-person evaluation.

The store-and-forward (SAF) teledermatology model has gained prominence, particularly during COVID-19, to address restrictions on in-person visits and improve care access. However, patient-taken photos often suffer from low image quality, reducing diagnostic accuracy and agreement with in-person diagnoses. Other challenges include privacy concerns, lack of standardized imaging guidelines, and limited insurance coverage, hindering broader adoption. Despite these drawbacks, SAF teledermatology is viewed as a valuable tool for expanding access to dermatologic care.

Recommendations include developing better image quality standards, addressing privacy issues, and improving reimbursement policies to enhance its effectiveness and integration into routine healthcare.

III. METHODOLOGY

3.1 Existing Methods

A.A search was conducted in MEDLINE, PubMed, and Embase for original articles mainly focusing on pediatric teledermatology and telehealth. Articles were reviewed for relevance based on their titles and abstracts, and those that did not relate to pediatric teledermatology before or after COVID-19 were excluded. The selected articles examined the

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practice, outcomes, and experiences with pediatric teledermatology, specifically comparing pre- and post-pandemic trends.

B.This systematic review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure rigorous reporting of evidence. A literature search was conducted on the PubMed database on May 10, 2020, using four keywords: "telemedicine pediatrics'', "telehealth pediatrics", "telemedicine kids," and "telehealth kids," which captured a broad range of relevant articles. The search applied filters for "randomized control trial" and "last ten years." Duplicate articles were removed, and titles and abstracts were screened for eligibility. Full-text articles were further reviewed, and disagreements were resolved through discussion.

C.A systematic review was conducted to evaluate pediatric teledermatology, focusing on diagnostic accuracy and satisfaction. Relevant studies from 2008 to 2022 were sourced from databases like PubMed, Scopus, and Google Scholar, using keywords such as "pediatric teledermatology" and "diagnostic concordance." Studies comparing teledermatology with in-person consultations were included, with a focus on diagnostic concordance and patient/provider satisfaction. Key data on diagnostic accuracy, satisfaction, and healthcare access improvements were extracted and analyzed, with particular attention to the impact of the COVID-19 pandemic on healthcare delivery

D. A broad literature review was conducted to assess teledermatology's impact on rural healthcare access. Studies from 2000 to 2022 were sourced from databases like PubMed, Google Scholar, and EBSCO host using keywords such as "rural teledermatology" and "dermatology access." The review focused on studies that addressed teledermatology's role in improving access, reducing wait times, and offering cost-effective solutions in rural settings. Key criteria included diagnostic concordance, healthcare access, and operational benefits like reduced travel times. Patient satisfaction and barriers to adoption, such as technological limitations and digital literacy, were also evaluated to assess teledermatology's effectiveness in overcoming healthcare disparities in rural areas.

E.This document reviewed the Australian teledermatology guidelines to ensure standardized and safe practices. The methodology involved analyzing official guidelines from The Australasian College of Dermatologists, focusing on best practices, patient selection, informed consent, image quality standards, and privacy protocols. The effectiveness of these guidelines in ensuring quality care and mitigating medico-legal risks was assessed across teledermatology modalities like store-and-forward and real-time video consultations. Additionally, the role of teledermoscopy in skin cancer screening and evaluating pigmented lesions was examined for its diagnostic accuracy and integration into teledermatology, with attention to digital security and patient safety.

3.2 Proposed Methodology

A. For Needs Assessment:
Analyze the current gaps in pediatric dermatology services, patient accessibility, and existing infrastructure. This includes surveying patient demographics, geographical constraints, and demand for telemedicine services.ps in pediatric dermatology services, patient accessibility, and existing infrastructure.
B. Planning and Design:
Develop a detailed project plan covering system architecture, platform selection, budget, timeline, and stakeholders. The design phase should focus on user-friendly interfaces, data integration, security protocols, and scalability.
C. Technology Integration:
Implement the telemedicine platform, ensuring seamless integration with existing Electronic Health Record (EHR) systems and other clinical software. Customize modules for pediatric dermatology-specific needs such as image analysis, patient education, and follow-up management.
D. Pilot Testing:
Conduct a small-scale trial involving a select group of providers and patients. Collect feedback on system performance, ease of use, diagnostic accuracy, and satisfaction levels.
E. Full-scale Deployment:
Roll out the teledermatology platform across the target region or healthcare system, ensuring training for all involved staff. Monitor the system for any issues and provide technical support.

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F. Ongoing Monitoring and Evaluation:

Continuously evaluate system performance, patient outcomes, and provider feedback. Adjust protocols, update software, and expand capacity as needed.

G. Modules Identified:

Patient Registration Module: Enables patients to register, create profiles, and provide necessary health information. Includes functionality for uploading dermatological images. Image Capture and Storage Module: Allows patients or caregivers to upload high-resolution images of skin conditions. These images are securely stored and linked to patient profiles for ongoing evaluation.

Consultation and Diagnosis Module: Facilitates live video consultations or store-and-forward image analysis. Dermatologists can assess conditions, provide diagnoses, and prescribe treatments. Model Training and Evaluation: Responsible for training various machine learning models using k-fold cross-validation and assessing their performance with metrics such as accuracy, precision, recall, and F1-score to evaluate generalization capabilities.

H. Objectives

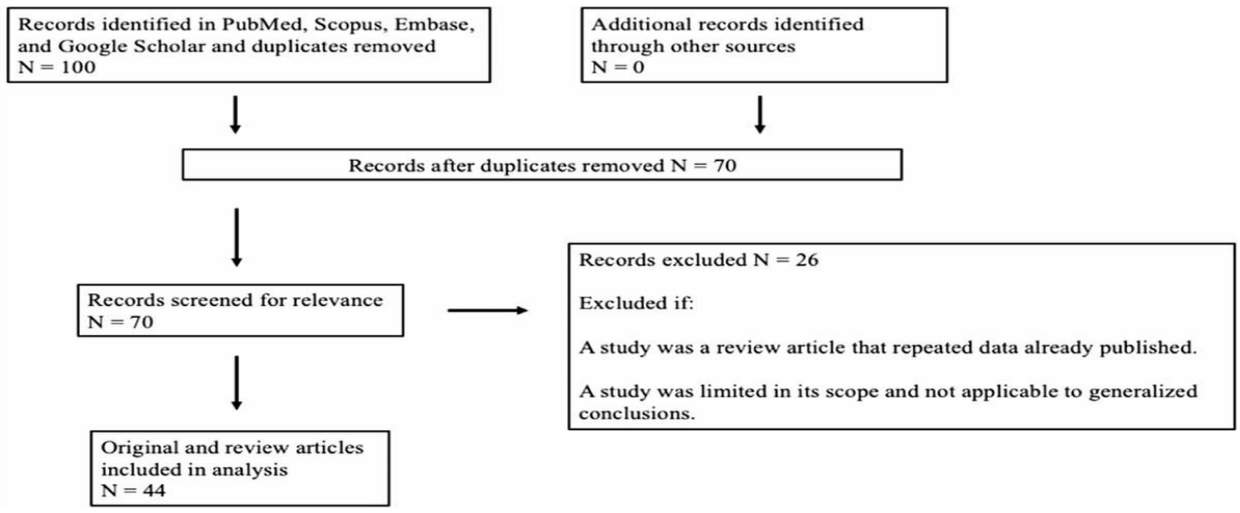
Improve Access to Dermatological Care: Expand the availability of dermatology services to children, particularly in underserved or remote areas where pediatric dermatologists are scarce. Reduce Wait Times for Appointments: Provide timely consultations to avoid long delays associated with in-person visits, thereby speeding up diagnosis and treatment.

Enhance Diagnostic Accuracy and Management: Utilize teledermatology tools to maintain a high level of diagnostic concordance with in-person evaluations, ensuring that children receive appropriate care. Lower Healthcare Costs: Reduce the financial burden associated with travel, missed workdays, and in-person appointments by using cost-effective telemedicine solutions.

I. Goals:

- Expand Reach and Accessibility
- Enhance Quality of Care
- Increase Efficiency in Healthcare Delivery
- Improve Patient and Family Satisfaction
- Reduce Healthcare Costs

3.3 DIAGRAM



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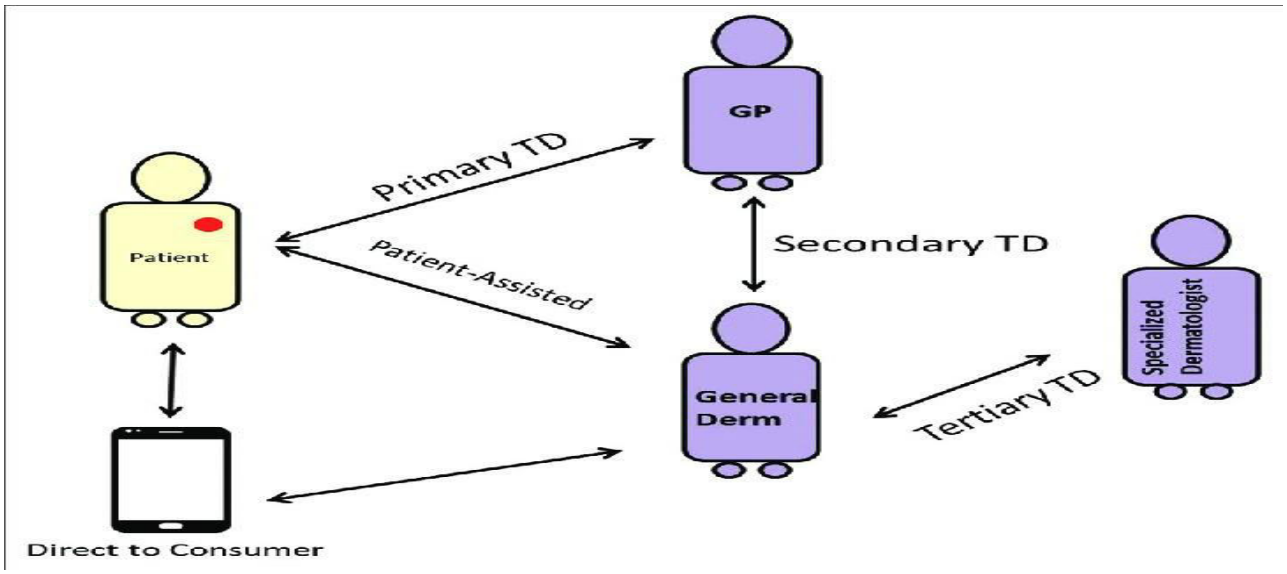

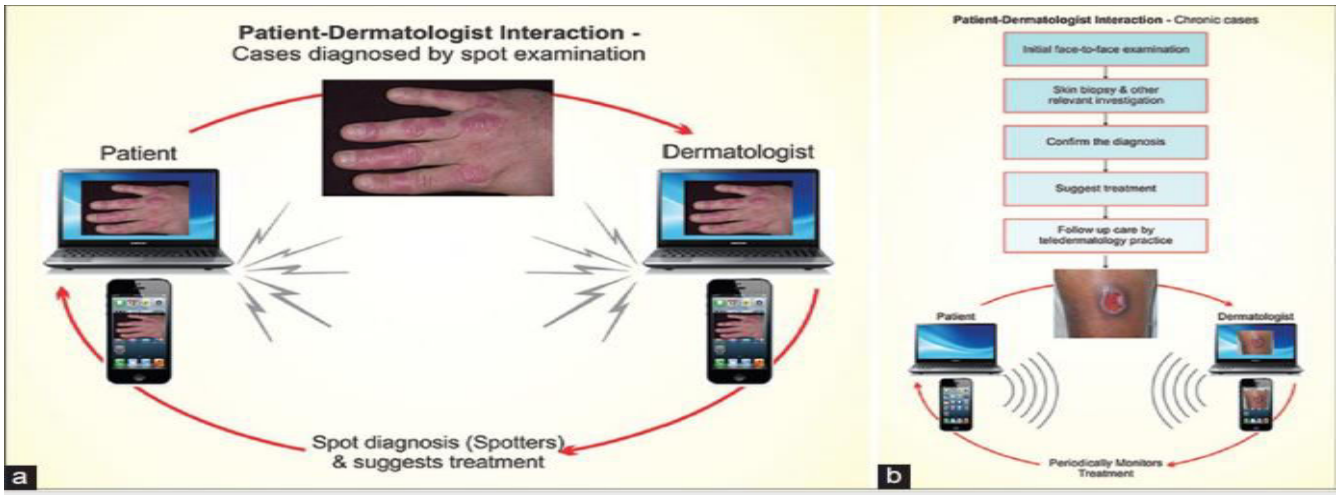

Figure 2: (a) Steps involved in patient-assisted teledermatology practice for cases diagnosed by spot examination.

IV. RESULTS AND DISCUSSION

Teledermatology has proven highly effective in improving access to dermatological care across pediatric and rural settings, with diagnostic concordance rates ranging from 70% to 97%. In pediatric care, there is no significant reduction in appointment and improved patient satisfaction, especially during the pandemic. However, challenges remain in diagnosing complex or rare conditions that require in-person assessments.

In rural areas, teledermatology has enhanced access to care, reduced wait times, and minimized travel burdens, though issues like varying image quality, poor internet connectivity, and digital literacy need to be addressed for broader adoption.

The Australian teledermatology guidelines provide a comprehensive framework for ensuring quality care, focusing on informed consent, image quality, and privacy standards. Teledermoscopy has improved diagnostic accuracy, particularly for pigmented lesions, with concordance rates of 81%-91%. However, limitations exist in diagnosing complex lesions and non-pigmented skin cancers.

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Overall, teledermatology is a valuable tool in enhancing care delivery, but further advancements in technology and overcoming operational barriers are essential for its full potential.

V. CONCLUSION

Teledermatology has proven to be an effective tool in improving dermatological care, particularly in pediatric and rural settings. It enhances diagnostic accuracy, patient satisfaction, and access to care while reducing wait times and the need for in-person visits. However, challenges remain, particularly with complex cases, technological barriers, and digital literacy, which need to be addressed to optimize its effectiveness. The integration of teledermoscopy has further strengthened teledermatology, especially for skin cancer screening, though advancements are needed for complex lesions. The Australian guidelines provide a solid framework for standardizing practices, ensuring quality care, and mitigating risks. With continued innovation and adherence to these guidelines, teledermatology is well-positioned to improve healthcare delivery, especially in underserved areas.

REFERENCES

1. Kim W, Sivesind T. Patient perceptions of dermatologic photography: scoping review. JMIR Dermatol 2022 Jan 26;5(1):e33361 [FREE Full text] [CrossRef]
2. Cartron AM, Aldana PC, Khachemoune A. Pediatric teledermatology: a review of the literature. Pediatr Dermatol 2021 Jan;38(1):39-44. [CrossRef] [Medline]
3. Kim JW, Lame M, Szalay L, Lefchak B, Johnsson B, Gogia K, et al. Telemedicine surge for pediatric patients in response to the COVID-19 pandemic in New York City. Telemed J E Health 2021 Oct;27(10):1105-1110.
4. Choi E, Mak W, Law J, Santos D, Quek S. Optimizing teledermatology: looking beyond the COVID-19 pandemic. Int J Dermatol 2021 Jan;60(1):119-121. [CrossRef] [Medline]
5. Katzow MW, Steinway C, Jan S. Telemedicine and health disparities during COVID-19. Pediatrics. Aug 2020;146(2):e20201586. [CrossRef] [Medline]
6. Havele SA, Fathy R, McMahon P, Murthy AS. Pediatric tele-dermatology: a retrospective review of 1199 encounters COVID-19 pandemic. J Am Acad Dermatol. 2022;87: 678-680
7. Betlloch-Mas I, Martinez-Miravete MT, Berbegal-DeGracia L, Sanchez-Vazquez L, Sanchez-Paya J. Teledermatology in paediatrics: health-care impact on the early treatment of infantile haemangiomas. J Telemed Telecare. 2021;27:424-430
8. Ray KN, Kahn JM. Connected subspecialty care: Applying telehealth strategies to specific referral barriers. Acad Pediatr. 2020;20(1):16-22. [FREE Full text] [CrossRef] [Medline]
9. Hoodbhoy,. Duan G, Ruiz De Luzuriaga AM, Schroedl L, Rosenblatt A. Disparities in telemedicine use during the COVID-19 pandemic among pediatric dermatology patients. Pediatr Dermatol 2022 Mar 18:10.1111/pde.14982. [CrossRef] [Medline]

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