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Challenges and Opportunities in Infantile Hemangioma Care Through Telemedicine

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ABSTRACT

Infantile hemangiomas (IHs) are the most common vascular tumors of infancy. While many regress spontaneously, a subset cause functional impairment, ulceration, or permanent cosmetic sequelae, making early recognition and timely treatment critical to prevent morbidity. With the growth of digital health, telemedicine has become increasingly relevant for IH evaluation and management. This narrative review examines the role of telemedicine in IH care, focusing on its benefits, limitations, and potential risks. Literature was identified through targeted searches of PubMed and Google Scholar using the terms infantile hemangioma, telemedicine, tele dermatology, diagnosis, and management, with priority given to clinical guidelines, systematic reviews, and large cohort studies. Telemedicine improves access, reduces wait times, and supports continuity of care. However, challenges include difficulty assessing lesion depth and high-risk features remotely, inconsistent image quality, and patient loss to follow-up. Risks are especially significant for syndromic IHs such as PHACE and LUMBAR, as well as for lesions threatening vision, airway function, or cardiac output. Emerging platforms that incorporate standardized imaging protocols and consistent triage processes show promise for improving diagnostic accuracy and follow-up adherence. Overall, telemedicine plays an important role in IH care, but it works best when paired with in-person evaluations as part of an integrated approach. Future work should aim to establish clear protocols and carry out comparative studies to better define best practices and ensure patient safety and outcomes.

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INTRODUCTION

Infantile hemangiomas (IHs) are the most common vascular tumor of infancy, affecting up to 10% of children during the first year of life [1,2]. While many lesions regress spontaneously, a significant proportion are associated with complications including ulceration, pain, functional impairment, and permanent cosmetic changes [3,4]. Because growth is most rapid during the first months of life, early identification is important in guiding care [5,6].

Telemedicine has become an increasingly important component of pediatric dermatologic care, allowing caregivers to share photographs, participate in video consultations, and access subspecialty expertise more rapidly [7,8]. Studies demonstrate that teledermatology can significantly reduce wait times, improve coordination between primary care and dermatology, and expand access for families living far from referral centers [9,10]. Together, these benefits make it a practical way to connect families with the care they need.

However, telemedicine also introduces unique challenges. Subtle but critical features, such as ulceration, deep extension, or segmental distribution, may be missed remotely, particularly when caregiver-submitted images are of variable quality [11,13]. Syndromic associations may also be overlooked without comprehensive in person evaluation [14,15]. Photos additionally shift greater responsibility to caregivers for providing high-quality images and accurate updates, which can introduce variability and increase the risk of delayed recognition of high-risk lesions [1,5]. These limitations underscore the need to balance telemedicine with careful in-person follow up when evaluating complex cases. Given the potential for complications, understanding the strengths and limitations of telemedicine in IH care is essential. This review examines its benefits, limitations, and risks, highlighting strategies to integrate telemedicine safely into clinical practice.

BACKGROUND

Infantile hemangiomas typically reach most of their growth by five months of age, which provides important clinical context when planning treatment [1,4]. Morbidity risk depends strongly on lesion location and extent. Periorbital IHs can lead to visual impairment, airway involvement may compromise breathing, and hemangiomas on the lip, nose, or perineum are prone to ulceration and secondary infection [5,3]. Large or segmental IHs may indicate syndromic entities such as PHACE or LUMBAR, which carry risks of neurologic, cardiac, ocular, urogenital, or skeletal abnormalities [13,14]. Recognition of these patterns helps direct appropriate evaluation and specialist involvement.

Clinical guidelines identify oral propranolol as the first-line therapy for problematic IHs, particularly when initiated early in the growth phase, and show consistent efficacy in reducing size and color [5,4]. Topical timolol may be considered for small superficial lesions, whereas laser therapy or surgery is reserved for refractory cases or for addressing residual fibrofatty tissue and scarring [3]. Regardless of treatment modality, structured follow-up is critical for monitoring treatment response, preventing adverse outcomes, and detecting rebound growth early.

Beyond clinical considerations, IHs often affect caregiver wellbeing. Visible lesions, ulceration, or delays in care can cause significant distress for families [1,2]. Comprehensive education on lesion progression and warning signs is essential, particularly when adapting care for virtual platforms [7,8]. Clear guidance not only reassures families but also improves early recognition, timely intervention, and overall clinical outcomes.

REVIEW

Standard of Care & Role of Telemedicine

Diagnosis of IHs relies primarily on careful clinical evaluation, including lesion morphology, growth pattern, and anatomical location [1]. Imaging is reserved for atypical, deep, or syndromic lesions to better assess structures at risk and guide multidisciplinary care when necessary [4]. While most small, localized IHs involute spontaneously and can be safely observed, early identification of high-risk lesions is essential to avoid preventable complications.

When treatment is indicated, oral propranolol remains the gold standard, typically dosed at 2–3 mg/kg/day in divided doses over six to twelve months, with duration individualized based on response and risk of rebound [5]. The therapeutic effect results from vasoconstriction, inhibition of angiogenesis, and induction of endothelial apoptosis, leading

to decreased lesion size and coloration. For small superficial IHs, topical timolol offers an effective, low-risk alternative, while procedural interventions like laser therapy or surgery are reserved for refractory or cosmetically significant cases [3]. Regular follow-up is important to track response, watch for side effects, and adjust treatment when needed.

Telemedicine has emerged as an increasingly valuable tool in IH management, particularly for families in rural or underserved areas [7,8], especially in today's generation where work and meetings are often virtual. Parent-submitted photographs and video consultations allow clinicians to monitor lesion progression, identify early complications, and provide reassurance or escalate care when needed [2,9]. Telemedicine can be a reliable way to follow low-risk lesions while reducing the burden of in-person visits.

Telemedicine also helps primary care providers and specialists work together, facilitating referrals and supporting shared decisions [10]. To keep care safe and responsive, clear protocols are needed, such as consistent image capture, caregiver guidance, and scheduled follow-ups to catch changes early.

Evidence from IH tele dermatology programs suggests that the future model is hybrid rather than only virtual. In a large Spanish pediatric tele dermatology program, 48% of teleconsultations were managed entirely remotely, although 59.6% of infantile hemangiomas were ultimately referred for in-person assessment; infants younger than two months were significantly more likely to require in-person evaluation, and tele-triage reduced the mean age at propranolol initiation from 5.6 months in those using standard referral pathways to 1.9 months among tele-referred infants [11].

Additionally, a large multicenter study of telemedicine use for IHs during COVID-19 provides important context for how virtual care performs in real practice. In a cohort of 281 patients across 15 international centers, hemangioma specialists reported very high confidence in their ability to evaluate and manage IH remotely, with a median confidence score of 95, particularly when photographs were incorporated into visits[12]. Telemedicine reduced referral to evaluation time to a median of 17 days, supporting its role in improving early access during the critical growth window. However, more than half of cases required additional photographs to complete an adequate assessment, highlighting the ongoing risk of incomplete visualization of depth, segmental patterns, and early complications [12]. Although this study supports the feasibility of initiating propranolol and monitoring standard risk IH remotely, it also reinforces why hybrid models that incorporate structured imaging and clear pathways to in person evaluation remain essential for detecting syndromic features, treatment nonresponse, and early rebound growth.

Diagnostic & Triage Failures

Telemedicine has expanded access to infantile hemangioma (IH) care but introduces challenges in early diagnosis and accurate risk stratification. Because IHs grow most rapidly during the early proliferative phase, delayed recognition of high-risk lesions can lead to missed therapeutic windows and worse outcomes [17]. Virtual consultations may underestimate lesion severity, resulting in postponed specialist referrals and delayed initiation of effective treatment.

A 2020 pediatric teledermatology study reported strong expert consensus on the need for in-person evaluation of suspected IHs due to the difficulty of assessing subtle but clinically significant findings such as duskiness, rapid growth, ulceration, or deep dermal involvement, from poor images or limited video visits [11]. Similarly, guidelines highlight that higher-risk features, including segmental facial hemangiomas, vision abnormalities, and poor feeding, are often overlooked during telemedicine encounters, particularly when syndromic associations are present [18]. This reinforces the importance of integrating telemedicine with timely in-person assessments for children at risk.

Evidence also shows that diagnostic accuracy is slightly lower with telemedicine compared to in-person evaluations. Mejia et al. found a 98% accuracy rate for in-person visits versus 90% for virtual consultations, with discrepancies largely related to poor image quality and connectivity issues [19]. While this difference appears modest, it becomes clinically significant in IHs where timely intervention is critical.

Distinguishing between standard-risk and high-risk IHs is particularly challenging in remote settings. Standard-risk lesions are typically small, focal, and located in low-risk regions, making them appropriate for telemedicine follow-up when caregivers provide high-quality images and are given structured education [18]. In contrast, high-risk IHs, including those affecting the periorbital area, lips, nasal tip, airway, or neck, as well as extensive or segmental lesions, require prompt in-person assessment due to risks of functional impairment, ulceration, and scarring [1,5,6,9]. Clear referral pathways are

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therefore essential to avoid delays in care and to prioritize children who need urgent evaluation.

Syndromic associations add another layer of complexity. Segmental IHs may indicate PHACE syndrome, characterized by craniofacial IHs, posterior fossa malformations, and arterial, cardiac, or ocular anomalies [14]. Similarly, LUMBAR syndrome involves lower-body IHs and may include urogenital anomalies, spinal defects, ulceration, and anorectal malformations [15]. These systemic features are best identified through a thorough in-person evaluation, making early recognition and involvement of multiple specialties critical when syndromic IH is suspected.

Technical & Treatment Pitfalls

While telemedicine has expanded access to infantile hemangioma (IH) care, it introduces technical and treatment-related challenges that can affect diagnostic accuracy and patient safety. One of the most frequent issues is image quality. Caregiver-submitted photographs often vary in resolution, lighting, framing, and scale, which can obscure important clinical details such as ulceration, duskiness, or lesion depth. A pediatric teledermatology study from the Children's Hospital of Philadelphia found that 83% of parent-submitted images were adequate for diagnosis, showing strong concordance with in-person assessments, but the remaining cases highlighted the limitations of low-quality images [13]. Photographs captured by trained clinicians consistently outperform caregiver-generated images in diagnostic and management accuracy, making standardized caregiver instructions and built-in platform quality checks especially important [16,27]. Establishing these measures can improve reliability in virtual care and help ensure that worrisome cases are not overlooked

Telemedicine also presents unique challenges in treatment safety and monitoring. Topical timolol, commonly used for small superficial IHs, is generally well tolerated but can cause systemic absorption when applied over large or ulcerated areas. Rare adverse events, including beta-blocker–related bradycardia and hyperkalemia, have been reported [21,22]. Oral propranolol remains the gold standard for high-risk or function-threatening IHs but requires baseline cardiac evaluation, caregiver education, careful titration, and close follow-up [5]. During the COVID-19 pandemic, propranolol was safely started in some cases through remote protocols that included home vital checks, early in-person review, and defined safety measures [18]. These experiences suggest that with the right safeguards, remote treatment models may help expand access without compromising safety.

Another significant concern is loss to follow-up, which can delay detection of rebound growth, a phenomenon occurring in approximately 6% to 25% of cases after discontinuation of beta-blockers [23,24]. When virtual care relies on sporadic image submissions or missed video visits, early signs of regrowth may be overlooked. Implementing structured monitoring protocols with predefined follow-up intervals, automated reminders, and clear transition plans to in-person care improves adherence and outcomes [10]. These steps are critical to detect regrowth early and restart treatment when needed.

Legal, regulatory, and safety challenges remain an important concern in the use of telemedicine. The main risks involve missed diagnoses and treatment delays, often linked to poor image quality or inadequate triage protocols [9]. Providers should ensure HIPAA compliance, obtain informed consent outlining the limitations of virtual care, adhere to state licensure requirements, and document clinical reasoning with the same rigor as in-person practice [26,27]. While general teledermatology standards exist, infantile hemangioma–specific guidelines remain limited, highlighting the need for protocols tailored to this patient population [24]. Developing such guidance will be key to ensuring that virtual care is safe, consistent, and aligned with best clinical practices.

Discussion & Recommendations

Telemedicine has expanded access to pediatric dermatology, offering timely evaluation for families with geographic or scheduling barrier [2,7]. While caregivers report high satisfaction with telemedicine, IHs require rapid recognition during a limited therapeutic window making any delay in care a critical risk [1,6]. High-risk lesions such as those near the airway, periorbital region, or with syndromic associations warrant early in-person assessment [5,20]. Clear triage practices are therefore essential to prevent delays in care for children at higher risk.

Technical limitations such as poor image quality underscore the need for standardized caregiver instructions and integrated imaging protocols [16,27]. Safe propranolol initiation via telemedicine will require structured workflows with home vitals and prompt follow-up to mitigate negative outcomes [5,18]. Similarly, monitoring for rebound growth

demands adherence to scheduled visits and reminder systems that optimize patient convenience [10,23]. Establishing these safeguards can help ensure that virtual care maintains the same standards of safety as in-person management.

Overall, hybrid models with initial in-person evaluation followed by structured virtual monitoring for low-risk cases appear to balance safety with accessibility. Future work should define IH-specific teledermatology protocols and assess outcomes directly against in-person care [24]. Ongoing research will be important to determine how these models can be integrated into routine practice.

Gaps in the Literature

Current evidence on the use of telemedicine for infantile hemangioma care is limited. Most available studies are retrospective, descriptive, or extrapolated from broader pediatric teledermatology research [6,10]. Prospective studies comparing telemedicine and in-person outcomes, as well as standardized protocols tailored to infantile hemangiomas, are needed to guide best practices [19]. For now, clinicians must rely on judgment and adjust current telemedicine approaches to fit the needs of IH care.

CONCLUSION

Telemedicine is playing a growing role in infantile hemangioma care. It improves access, reduces travel for families, and allows earlier evaluation in children who might otherwise face delays. At the same time, important details can be missed, and treatment follow-up is not always reliable without clear systems in place. A mixed approach, with in-person visits for high-risk cases and structured virtual follow-up for low-risk cases, seems to offer the safest and most practical balance. Clear caregiver education, guidance on photo quality, and dependable follow-up schedules will be important for making this model work.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

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