Interactive communications technologies (ICTs) are key sites of self-discovery, community formation, health education, and creative expression among the 0.7–3.2% of young people who identify as transgender and gender-expansive (TGE). mHealth interventions intended for TGE users are situated within—and, increasingly, informed by—this rich online milieu. ICTs permit socially isolated users to transcend the limitations of their physical environments, in which TGE social bonds, gender-affirming hormone therapy (GAHT) providers, or physical safety, may be lacking. This is particularly true of TGE youth, who may lack autonomy or in-person support (1). A diverse, innovative range of ICT interventions serves the gender-affirmation needs of TGE users. As noted by Skeen et al. (1), these interventions can be classified along distinct lineages: (I) academic medicine, often via NIH-funded clinical trials; (II) human-computer interaction, user experience (UX) design, and adjacent subfields; and (III) TGE-led community technologies, often developed via hackathons and crowdfunding.

Since the initial, July 2020, publication of that scoping review (1), upheavals have occurred within TGE mHealth, with implications for mHealth self-sustainability, broadly. Most can be traced to the COVID pandemic, which disproportionately burdened marginalized subpopulations. Jarrett et al. surveyed transgender and nonbinary respondents across 76 countries from April–August 2020, 55% of whom reported diminished access to gender-affirming care due to the pandemic; 38% were less able or unable to live in accord with their genders at all (2). In the U.S., the Centers for Disease Control and Prevention recommended the suspension of in-person appointments. Federal regulations that had restricted reimbursement for telehealth services and barred cross-state practice were relaxed (3,4). These changes vastly expanded access to telemedicine, permitting TGE young people to access primary care, counseling, and GAHT initiation virtually, or via hybrid models of care, typically extensions of established providers (3,4). Presently, telehealth cannot replace key aspects of in-person (particularly pre-surgical) consultation (3), which most TGE youth prefer for GAHT initiation (4). And an “either/or” approach to such questions overlooks the possibility of telehealth-supported specialist consultations and similar hybrid models (4). Emerging evidence shows promise in the acceptability, usability, patient satisfaction, and cost-effectiveness of gender-affirming telehealth, particularly among TGE youth who feel unsupported by their parents (3,4).

Where TGE eHealth in the COVID era departs most radically from the past is in its abrupt, recent, turn toward venture capital (VC)-backed commercialization. Exemplifying this turn are the telehealth services Folx and Plume. Forgoing any brick-and-mortar presence, both offer GAHT initiation, maintenance (4), and wraparound care tailored for sexually and gender-diverse patients,
for the cost of a monthly out-of-pocket subscription fee: $100/month, approximately, not including the cost of medication (5). The Solace app, covered in Skeen et al. (1), is now the flagship offering of VC-backed Euphoria.LGBT Inc., which is developing a suite of TGE-tailored apps. The amounts invested toward their eventual profitability are non-trivial: $29,400,000 to Folx Health across seed, venture, and Series A funding rounds; $14,000,000 raised by Plume in a Series A round; and $580,000 to Euphoria. LGBT in pre-seed and crowdfunding, according to the competitor-intelligence platform Crunchbase (6). These VC-backed services are compared in detail atop (Table 1).

Responses to these services, among some transgender and nonbinary media-makers, were negative, verging on resistant (7), in a manner that is illustrative of broader, unresolved, tensions inherent to mHealth scale-up and sustainability. In ways, the backlash recalled Gorski et al.’s reports of resistance to revenue-generating mHealth implementations that, to the communities they aimed to serve, appeared to commodify longstanding traditions of community-centered care (8). TGE and sexually diverse communities have survived via, and often take pride in, enduring networks of community care, through which specialized medical knowledge, social support, and direct mutual aid are disseminated—often along ICT channels: Tumblr, Reddit, Discord, and many more (1,7). In contrast, Folx, Plume, Solace, and Bliss, with their infusions of capital, polished marketing materials, and (in the case of Euphoria.LGBT) upfront emphasis on financial viability, seemed to herald the appropriative, extractive ethos of neoliberalization (7,9). Neoliberal restructuring, hostile to collective models of social welfare, recasts underserved subpopulations as untapped consumers, primed for revenue-generating free-market solutions. Such models, historically, have gained traction through crisis-driven regulatory turbulence and capture (9), such as that which accompanied the initial waves of COVID-19 in the U.S. (3). Yet Plume, Folx Health, and Euphoria.LGBT are TGE- and queer-led. Plume and Folx offer microgrants for transgender, nonbinary, and questioning patients unable to pay for GAHT (5). Solace, alongside other Euphoria. LGBT offerings, is free to use. And, even as their launches have attracted attention, the feature-rich and innovative ecosystem of TGE mHealth has continued to flourish. Updates to the interventions covered in Skeen et al. (1), alongside new launches since July 2020, are detailed in Table S1 (available at osf.io/dnt6y).

More broadly, the value proposition inherent to subscription telemedicine, for patients who may lack access to any traditional brick-and-mortar providers, is self-evident: ease of access to care is emphasized by a plurality of mHealth projects, worldwide (8). Beyond contexts, such as gender-affirming care, in which unfavorable provider-to-patient ratios are urgent concerns, the consumer appeal of simple convenience is indisputable. Indeed, durable business models are crucial to mHealth self-sustainability, and to population health impact, by extension, regardless of context (8,10). But subscription-based access, over and above the expense of medication may, too easily, translate to exclusivity: a “concierge” model that would leave behind the disproportionate share of TGE people who endure poverty (3). Reflecting this possibility, the negative responses to Plume, Folx, and Solace raise broader questions of whether financial self-sustainability models, adopted late in a mHealth development lifecycle, can undo earlier-established gains in acceptability and cultural congruence.

The growth of GAHT initiation via telehealth has led to calls to closely monitor young TGE patient outcomes (4). Plume and Folx present prime opportunities to study, and to advance, “queer UX” in eHealth (5). Alongside these calls, we recommend mHealth investigators devote resources to understanding their projects’ possible models for financial self-sustainability early in the project lifecycle (8,10), and to the adverse reactions—the resistance—these models may provoke among communities of end-users with strong traditions of self-reliance.
# Table 1 Summary of gender-affirmative VC-backed digital health interventions (n=7) launched since July, 2020

| Name, description | Modality | HIV prevention- and/or care-focused | Evidence summary | Explicit theoretical grounding | Key/unique features | Gender affirmation dimension | Source |
|-------------------|----------|-------------------------------------|------------------|-----------------------------|---------------------|-----------------------------|--------|
| Bliss, a Euphoria.LGBT, Inc. platform, automatically directs a predetermined proportion of a TGE user's income toward self-assigned gender-affirmation goals (which closely mirror those of Solace). Examples include “Buying a dress,” with a range of cost estimates derived from web sources; and “Start [hormone replacement therapy] (Estrogen+),” with links to Plume’s subscription offerings | Smartphone app: iOS and Android | No | No formative, UX, or outcomes research available ("none available" hereafter) | None available | Behavioral self-monitoring; Password protection; TGE-curated informative resources | Embodied*; legal; psychological; social | Euphoria.LGBT, Inc. Bliss LGBT. Version 1.2 [iOS], 1.9 [Android], 2021 |
| Clarity, a Euphoria.LGBT offering, is a standalone app that permits users to fix their present sense of gender identity, expression, and attractions toward others along a linear female-to-male continuum represented by touch sliders. Cf. Gendo | Smartphone app: iOS and Android | No | None available | None available | – | Psychological | Euphoria.LGBT, Inc. Clarity LGBT. Version 1.0 [Android]. 2020 |
| Devotion, another Euphoria.LGBT app, is a lightweight app that provides routine affirmations intended for TGE users. Affirmations are self-selectable to appeal to “content,” “anxious,” “brave,” and “lonely” emotions | Smartphone app: iOS and Android | No | None available | None available | – | Psychological | Euphoria.LGBT, Inc. Devotion LGBT. Version 1.1 [iOS], 1.1 [Android]. 2021 |
| Folx is a subscription telehealth service that offers holistic GAHT service, with “new start/restart” and maintenance pricing tiers, in 33 U.S. states. Additionally, primary care services (nutrition, fertility, sexual health including ED, etc.) are available, plus referrals to local brick-and-mortar providers. Folx does not maintain a “brick-and-mortar” (physical location) presence, nor by extension, are in-person services available. Cf. Plume, GenderGP, QMed | Telemedicine/online video counseling | No, but PrEP initiation, maintenance, and sexual health services are available | None available | None available | Remote video counseling; TGE-curated brick-and-mortar resources; TGE-curated informative resources | Embodied; psychological; social | Folxhealth.com. Accessed January 29, 2022 |
Table 1 (continued)

| Name, description | Modality | HIV prevention- and/or care-focused | Evidence summary | Explicit theoretical grounding | Key/unique features | Gender affirmation dimension | Source |
|--------------------|----------|----------------------------------|------------------|-----------------------------|-------------------|---------------------------|--------|
| **Plume** is a subscription telehealth service that provides virtual consultations for, initiation, instruction (e.g., on self-injection), maintenance of GAHT for patients aged 18–65 years in 33 U.S. states. Prescriptions to local pharmacies and home delivery is included. A range of gender-affirming medications, including hair loss and ED therapies, and letters of support for gender-affirming surgeries and legal name-change documents, are also provided. **Plume** does not maintain a brick-and-mortar presence, nor by extension, are in-person services available. Cf. **Folx, GenderGP, QMed** | Telemedicine/online video counseling | No | None available | Remote video counseling; TGE-curated brick-and-mortar resources; TGE-curated informative resources | Embodied; legal; psychological; social | Getplume.co. Accessed January 29, 2022 |
| **Solace**, the flagship app of Euphoria.LGBT, Inc., is a suite of tools tailored for TGE users, including self-assignable goals (differentiated by medical, legal, and social domains) that provide in-depth educational modules on topics such as “Creating a hidden photo vault,” “Interacting with the TSA,” and accessing GAHT via the above-mentioned **Plume** platform. Integrations with **Bliss** (above) and the TGE-tailored **Windfall** online marketplace are available. Cf. **TransTracks**. **Solace Child Mode**, adapting these features for caregivers of TGE children, remains, to date, in open Beta | Smartphone app: iOS and Android | No, but “HIV, STIs, & Other Infectious Diseases” education is available | None available | Behavioral self-monitoring; Password protection; TGE-curated informative resources | Embodied; legal; psychological; social | Euphoria.LGBT, Inc. Solace LGBT. Version 3.3 [iOS], 5.0 [Android]. 2022 |

*, as in our earlier review (1), we replace “medical affirmation” with “embodied affirmation” in order to capture bodily interventions, such as chest-binding and electrolysis, accessible in non-medical settings. Evidence summaries are as of February 2022. Results are limited to English-language (partially, or in full) platforms and records. VC, venture capital; UX, user experience; TGE, transgender and gender-expansive; GAHT, gender-affirming hormone therapy; ED, erectile dysfunction; PrEP, pre-exposure prophylaxis; STI, sexually transmitted infection.
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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Table S1: Summary of technology-enabled (N=2) interventions involving TGE youth. Updates since July, 2021 (Skinner SJ, Can D). mHealth for transgender and gender-expansive youths: an update on COVID, revenue capital, and the cultural incongruence of resources-driven sustainability models

| Name, description | Modality | HV prevention- and/or care-focused | Explicit theoretical grounding | Evidence summary | Key/unique features | Gender affirmation dimension |
|------------------|----------|------------------------------------|-------------------------------|-----------------|---------------------|-----------------------------|
| Aligned Voice is a project of Weill Cornell Medical College, Ithaca College and Stony Brook University, and a TGE advisory committee, which aims to broaden the availability of high-quality tools to aid TGE and nonbinary individuals in attaining a voice congruent with their gender identity (11) | Smartphone app: iOS | No | None available | Behavioral self-monitoring; Biobehavioral; TGE-curated informative resources | Psychological; social |
| Deafness Earzer is an expansion of Apple's headset browser, which allows TGE users to automatically replace their deafnessm, or gender-incongruent birth names, in online documents. It is open source, with code, and French- and Spanish-language localizations, available on GitHub (12) | Smartphone app: iOS | No | None available | – | Psychological; social |
| GenderTag presents users with a series of highly granular "gender tags," which name and synopsizes identities such as genderfluid, demigirl, and agender, among others. Users can add photo avatars to their chosen descriptions and export them for sharing (14) | Smartphone app: Android | No | None available | – | Psychological; social |
| LifeSkills Mobile presents trans-feminine spectrum users (aged 26–28) with 4 modules to address self-concept and self-esteem, communication in the context of discrimination; education on sexual behavior; and gender transition; and motivation and behavioral skills for safer sex, condom use, and substance use. A large-scale efficacy trial of the mobile intervention is currently underway, by researchers at UCLA and University of Chicago (13) | Internet/webapp | Yes | Adapted from the in-person, group-based, Project LifeSkills intervention, which demonstrated efficacy to reduce condomless vaginal and anal sex acts at 12 months post intervention (20) | Theory of Empowerment (21); Information, Motivation, Behavioral skills model (IBM; 22) | Gamification; TGE-curated informative resources | Psychological |
| Project Spectra, a collective project facilitated by researchers at Northeastern University, is a free and open-source voice training app that emphasizes affirmation, playfulness, care, and self-determination among TGE users, unconstrained by co-normative expectations of gendered voice pitch (23-24) | Smartphone app: iOS and Android | No | None available | – | Psychological; social |
| Phylle Voice & Speech Therapy is a suite of voice tonification tools and exercises available for purchase by users who may wish to attain a more feminine voice (25) | Smartphone app: iOS and Android | No | None available | – | Psychological; social |
| GenderGP is the titular app for a private UK-based telahleah provider of gender-affirming care. GenderGP, operating on a monthly subscription model, both works in partnership with a network of laryngologists, speech language pathologists, mobile developers, designers, and TGE advocates to drive additional resources, plus is discoverable, through an innocuous transit app (38) | Smartphone app: iOS | No | None available | Remote video counseling; TGE-curated informative resources; Provider education | Embedded; psychological; social |
| QMed is a gender-affirmative telemedicine practice serving TGE patients across the southeast U.S., including via GAHT. While certain services, such as testosterone initiation, previously required in-person consultation, the service is now entirely virtual. Uniquely, among GAHT-providing telemedicine services, QMed accepts health insurance (29) | Telemedicine/ online video counseling | No | None available | – | Embedded; legal; psychological |
| Rate My Voice allows anonymous TGE and other users to submit and review short digital audio samples, assessing each speaker for attractiveness and confidence (27) | Smartphone app: iOS and Android | No | None available | – | Psychological; social |
| Text Me, Girl! presents TGE youth with a series of highly granular "gender tags," which name and synopsizes identities such as genderfluid, demigirl, and agender, among others. Users can add photo avatars to their chosen descriptions and export them for sharing (14) | Smartphone app: iOS and Android | No | None available | – | Psychological; social |
| Transgender Empowerment by Texting (TeXT) is an interactive SMS intervention delivered 4 days a week for 8 weeks by a masters' level intervention coach. The intervention aims to reduce anxiety and depression and increase social support among TGE and nonbinary adults. TeXT was developed by researchers at Oklahoma State and Southern Illinois University (33) | Smartphone app: iOS and Android | No | None available | – | Psychological |
| TransWomen Connected is a mobile app of the Transgender Welfare Board, Social Welfare and Women Empowerment Department, of the Government of Tamil Nadu, India. Through the app, transgender (trans women) and intersex (trans men) can apply to the state's TGE-related social welfare programming for housing, education, and gender-affirming healthcare coverage (36,37) | Smartphone app: iOS | No | None available | – | Embedded; psychological; social |
| TransTracks is a personalized transition tracker, allowing TGE users to log time-stamped changes to their faces and bodies, presumably in response to GAHT. The app includes a "deep cover" mode, in which it masquerades as an innocuous transit app (38) | Smartphone app: iOS | No | None available | – | Embedded; psychological; social |
| Trans Women Connected focuses on gender affirmation; personal goal-setting; PEP education; listings on PEP providers, and medical, legal, and educational services; (39) | Smartphone app: iOS | Yes | In response to the ongoing COVID Pandemic, Trans Women Connected has added educational modules on COVID safety and mitigation strategies. A-ear cluster RCT of Trans Women Connected is underway (Christina J. Sun, PhD, e-mail communication, January 2022) | – | Embedded; legal; psychological |
| Trans Women Connected is a mobile app of the Transgender Welfare Board, Social Welfare and Women Empowerment Department, of the Government of Tamil Nadu, India. Through the app, transgender (trans women) and intersex (trans men) can apply to the state's TGE-related social welfare programming for housing, education, and gender-affirming healthcare coverage (36,37) | Smartphone app: iOS | No | None available | – | Embedded; psychological; social |
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| TransWomen Connected is a gender-affirmative telemedicine practice serving TGE patients across the southeast U.S., including via GAHT. While certain services, such as testosterone initiation, previously required in-person consultation, the service is now entirely virtual. Uniquely, among GAHT-providing telemedicine services, QMed accepts health insurance (29) | Telemedicine/ online video counseling | No | None available | – | Embedded; legal; psychological |
| TransWomen Connected focuses on gender affirmation; personal goal- setting; PEP education; listings on PEP providers, and medical, legal, and educational services; (39) | Smartphone app: iOS | Yes | In response to the ongoing COVID Pandemic, Trans Women Connected has added educational modules on COVID safety and mitigation strategies. A-ear cluster RCT of Trans Women Connected is underway (Christina J. Sun, PhD, e-mail communication, January 2022) | – | Embedded; legal; psychological |
| TransWomen Connected is a gender-affirmative telemedicine practice serving TGE patients across the southeast U.S., including via GAHT. While certain services, such as testosterone initiation, previously required in-person consultation, the service is now entirely virtual. Uniquely, among GAHT-providing telemedicine services, QMed accepts health insurance (29) | Telemedicine/ online video counseling | No | None available | – | Embedded; legal; psychological |
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* As in our earlier review (1), we replace "medical affirmation" with "embodied affirmation" in order to capture bodily interventions, such as chest-binding and electrolysis, accessible in non-medical settings. † No substantive updates to Blinder Weinberg, Christella VoiceUp, EVA, Transgender Pelvic Health, Patch Day, Project Muse, QueerDoc, RefugeRostems, Safe Transgender Bathroom-App, ShortTran, unnamed Washington, DC telehealth intervention, were discoverable. The TechStep I trial remains ongoing. OI: Siven et al. (33). Spokane Trans Map is no longer available in GIS or Android. ‡ Because rendering specific details of this app developers are open on the web, we categorize in this report. Evidence summaries are as of February 2022. Results are limited to English-language (partially, or in full) platforms and records. ED, erectile dysfunction; GAHT, gender-affirming hormone therapy; RCT, randomized controlled trial; TGE, transgender and gender-expansive.
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