

ORIGINAL ARTICLE

Genetics providers' experiences using telehealth: A grounded theory approach

Lauren A. Beretich  | Sara M. Sarasua | Jane M. DeLuca

Healthcare Genetics, School of Nursing,
Clemson University, Clemson, South
Carolina, USA

Correspondence

Lauren A. Beretich, Healthcare Genetics,
School of Nursing, Clemson University,
Clemson, SC, USA.

Email: lbereti@g.clemson.edu

Abstract

There was a paucity of research describing the perspectives and experiences of clinical genetics providers in telehealth prior to the SARS-CoV-2 pandemic. The available literature focused primarily on provider satisfaction and offered limited insight into genetics providers' work in telehealth. The purpose of this study, conducted just prior to the widespread knowledge of SARS-CoV-2 in the United States and mass transition to telehealth, was to understand the telehealth process from the vantage of genetics providers working in telehealth practice settings. This research employed grounded theory using the constant comparative method in coding and analysis of data to generate theory. Ten genetics providers were interviewed over the phone about their experiences, specifically the efficacy of telehealth work, providers' perspectives of patient outcomes, and personal fulfillment derived from telehealth patient care. Six themes emerged in the study: *Making Professional Choices*, *Increasing Patient Access*, *Providing Effective Services*, *Understanding Telehealth Limits*, *Feelings about Telehealth Consultations*, and *Deepening Personal Fulfillment*. These major themes guided the creation of the Theoretical Model of Telehealth Providers in Genetics, which depicts the connections between providers' personal fulfillment in telehealth, commitment to patient services, and the provision of telehealth to the public. This model may help others who are working on telehealth initiatives or developing telehealth programs. Findings from this study can support the current use and the growth of telehealth in genetics as a result of the SARS-CoV-2 pandemic. Future research is needed to describe the telehealth process and develop valid instruments for assessing and measuring the constructs of the Theoretical Model of Telehealth Providers in Genetics.

KEYWORDS

genetic counseling, genetics services, healthcare providers, telehealth, telemedicine

1 | INTRODUCTION

Genetics and genomics have been increasingly incorporated into healthcare services (Stark et al., 2019). The genetics workforce (e.g., geneticists, genetic counselors, genetic nurses, and

physician assistants), however, is unable to meet the patient demand (Maiese et al., 2019). Therefore, telehealth is one strategy deployed to increase the outreach and patient accessibility of clinical genetic services (Hilgart et al., 2012). Telehealth can allow for more patients to be seen in a finite amount of time through

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. *Journal of Genetic Counseling* published by Wiley Periodicals LLC on behalf of National Society of Genetic Counselors.

streamlined workflows, reducing the time burden of administrative tasks, and/or shortened consultations, due to history collection or baseline education provided pre-consultation (Boothe et al., 2021; Committee on Pediatric Workforce et al., 2015; Johnson et al., 2020; Nazareth et al., 2021). The patient experience with telehealth in genetics or telegenetics has repeatedly demonstrated high levels of patient acceptance and satisfaction (Danylchuk et al., 2021; Hilgart et al., 2012; Solomons et al., 2018; Voils et al., 2018; Vrečar et al., 2017). Conversely, literature regarding the provider experience with telegenetics is mixed (Danylchuk et al., 2021; Hilgart et al., 2012; Vrečar et al., 2017). Providers are generally satisfied with delivering telegenetic services, while limitations or areas of improvement are often reported across genetic specialties (Hilgart et al., 2012; Vrečar et al., 2017; Zierhut et al., 2018). The few researchers who compared the satisfaction of both patients and providers receiving and providing telegenetic services, respectively, have shown that patients are more satisfied with the telehealth experience than their provider counterparts (d'Agincourt-Caning et al., 2008; Iredale et al., 2002; Otten et al., 2016). Technical difficulties were postulated to impact provider satisfaction, but a clear rationale for these findings has not been determined (d'Agincourt-Caning et al., 2008; Iredale et al., 2002; Otten et al., 2016).

There is a need to understand the experiences of genetics providers to contextualize telehealth practices and help shape the development of new and future programs. If not addressed, there are potential implications for provider retention, the quality of patient care, and service reimbursement (Donelan et al., 2019; Moore et al., 2017; Wechsler et al., 2017). The purpose of this study was to describe the telehealth process from the viewpoints of genetics providers working in clinical telehealth practice settings.

2 | MATERIALS AND METHODS

This study was approved as exempt by the Clemson University Institutional Review Board. A non-experimental study design of grounded theory was used. Grounded theory is built upon the principle of inductive research methods to generate a theory (Glaser & Strauss, 1967). Grounded theory permits the development of a coherent set of concepts that explain or interpret a particular phenomenon. While various iterations of grounded theory exist, Charmaz's constructivist grounded theory was chosen for this study and is known for its focus on the literal construction of meaning, aided by the researcher's own interpretation and co-construction of the data (Charmaz, 2014).

Theoretical sampling (Charmaz, 2014) was applied to recruit participants who represented a variety of clinical non-profit agencies, then expanded to commercial practices. Individuals met inclusion criteria if they were practicing genetics providers (genetic counselors and geneticists with MS or MD credentials) in the United States with at least one year of telehealth experience and delivered clinical genetics care by telehealth at least 10% of the time. The inclusion

What is known about this topic?

Telehealth is a useful tool for clinical genetic services, perceived more as an adjunct service prior to the SARS-CoV-2 pandemic. Genetics providers have reported both positive and negative experiences when using telehealth for patient care.

What this paper adds to the topic?

This paper provides insight into the experiences of modern genetic counselors and geneticists using telehealth, including their motivations for telehealth work, overall satisfaction, and perceptions of effectiveness. In addition, the described Theoretical Model of Telehealth Providers in Genetics provides a novel framework for new and growing telehealth programs.

criteria were necessary to ensure that data was gathered from appropriate providers in the telehealth genetics field with adequate experience in providing genetic services by telehealth. Thirty-five individuals were offered participation in this study. Participants were identified using professional contacts of the PI and Co-PI and two telegenetics professional community groups through Facebook and Slack. Recruitment continued until data saturation was met. A total of 11 individuals were ultimately recruited. One individual ceased to respond. For this study, telehealth was defined as synchronous patient care using audio or audiovisual technology. Study participants were from diverse regions, practice setting specialties, and differed in years of practice. The majority of participants were genetic counselors.

Participants were interviewed by one or simultaneously by two interviewers with experience in qualitative interviewing. Semi-structured interviews were conducted with all participants to explore providers' experiences and generate data related to the provision of telehealth care. The study foci were developed around three domains: (1) the efficacy of telehealth work, (2) providers' perspectives of patient outcomes, and (3) providers' personal fulfillment derived from telehealth patient care. The research team provided participants with a copy of the interview guide (see Supplement 1) and the informed consent document in advance of their interview. At the time of the interview, participants provided verbal consent before proceeding. All interviews were audio recorded and transcribed. Participants had the option to enter a drawing for a \$100 eGift card to a local retailer.

Qualitative software, ATLAS.ti version 8.4.4, was used for coding (initial, focused, and theoretical) and storing the transcribed data. As interviews were collected, the data was analyzed using the constant comparison approach, moving within and between interview data to inform questions moving forward and for analysis. The PI and Co-PI listened to the audio recordings, read the transcripts, and collaborated to compare categories and develop study themes.

3 | RESULTS

A total of ten telehealth providers were recruited and participated in this study between February and March of 2020. The mean interview length was 43 min per study participant, ranging from 20 min to 1 hr and 34 min. Participants consisted of nine genetic counselors and one geneticist, all trained and practicing in the United States. Participants had varying amounts of telehealth experience ranging from 1.5 to 6 years, with an average of greater than 3.4 years. The time devoted to telehealth practice among participants ranged from 10% to 100%, with most participants spending over 50% of their workweek using telehealth. Additional demographic and practice information of the study participants is detailed in Table 1. Qualitative data analysis from the coded interviews revealed six major themes related to the providers' perceptions of the efficacy of telehealth, personal views of their work, and their relationship to their patients. These themes included Making Professional Choices, Increasing Patient Access, Providing Effective Services, Understanding Telehealth Limits, Feelings about Telehealth Consultations, and Deepening Personal Fulfillment. A theoretical model was developed to illustrate the integration of study themes.

3.1 | Making professional choices

Participants reported being intentional about choosing a telehealth position. Telehealth was being used or developed for clinical genetic services at the time of hire for most participants ($n = 9$). A number of individuals reported the opportunity to work from home was one of the most compelling reasons to choose a position which uses telehealth. "... the reason I made the transition to telehealth, one

of the primary reasons, is because I wanted to work from home." -Participant 10, Genetic Counselor.

Some participants also chose a telehealth position because they were eager to have a more flexible schedule. Certain participants were able to have more control of their schedule, including the ability to end the workday early, use less paid time off when partaking in personal travel, or work nights and weekends, if desired. "I like the flexibility of being able to set my own schedule and my hours can be a little bit less typical than what I would have in the clinic as typical nine to five day." -Participant 2, Genetic Counselor.

Other participants were attracted to a position in telehealth to use new technology and experience a novel service delivery model. "The day I interviewed ... [an interviewer] talked about [telehealth] extensively and asked me if I would be okay joining a clinic where this would be a possibility and, of course, I was onboard with that. I thought it was a really interesting idea." -Participant 4, Genetic Counselor.

3.2 | Increasing patient access

Participants cited patient access as the primary rationale for using telehealth and an important part of the delivery of patient care. Participants reported that telehealth affords patients the opportunity to receive genetics care more quickly and conveniently. "... [Telehealth] allows patients who would not have access to genetic counseling services [access] because ... they live in a very rural area, or they live in an area where there are very long wait times." -Participant 10, Genetic Counselor.

Patient access was improved due to the virtual or remote nature of telehealth, the increased number of available providers

TABLE 1 Participant demographics and practice details ($n = 10$)

| Gender | Female (9) | Male (1) |
|---|--|---|
| Professional Status | Geneticist (1) | Genetic Counselor (9) |
| Age in Years | Under 30 (2) | 30–39 (4) 40+ (4) |
| Years of Clinical Practice | 1–4 (2) 20–24 (0) | 5–9 (3) 25–29 (0) 30+ (0) |
| Clinical Genetics Training Program Region (USA) | Northeast (2) Midwest (1) | South (4) West (1) |
| Physical Practice Location Region (USA) | Northeast (3) Midwest (2) | South (4) West (1) |
| Genetic Specialty | Reproductive Health (2) Oncology (3) Pediatrics (1) Laboratory (1) | Prenatal (1) Generalist (1) Dual Specialty ^a (1) |
| Telehealth Modality | Audio Only (7) | Audio ± Video (3) |
| Practice Space | Home (7) Multiple Available Spaces (1) | Clinic (2) |

^aOne provider with two areas of specialization.

(compared to one geographic area), and reduced costs of travel, time off work, and parking. "... [genetics providers] don't have enough hours in a day to meet the need, so I think telehealth is definitely a viable way of meeting the needs of a lot of patients because then I can speak to someone in California or in China who may not otherwise have access to care." -Participant 5, Genetic Counselor.

Telehealth providers, especially those who work with private companies or commercial laboratories, often collaborated with non-genetics providers. These partnerships provide patients further access to genetic services to those who may have declined or not pursued these services otherwise. "... [the providers, they feel comfortable ordering the testing and explaining the results, but they want patients to still go through that extra education." -Participant 6, Genetic Counselor.

3.3 | Providing effective services

Participants unanimously reported providing effective genetic services by telehealth. "... I think it's effective. It gets the job done as effectively as in person, so I don't have a lot of concerns utilizing it at this point in time." -Participant 4, Genetic Counselor. However, participants measured or appraised their effectiveness in different ways. In some cases, participants sent formal surveys to patients to assess efficacy.

Study participants also used observed patients' replies to gauge their clinical effectiveness. These included patient response(s) and reflection(s) during the consultation, the number and type of patient questions asked during and following the consultation, and patient written or verbal feedback. "The patients I find are asking the right questions and that makes me feel like, yes, they are understanding what I'm saying" -Participant 2, Genetic Counselor.

Effectiveness of telehealth consultations was also shown to vary based on patient preferences, indication(s) for consultation, a particular patient population, and one's history of genetic services. "I think there are certain individuals, certain families who just aren't comfortable with it and they shouldn't be forced to utilize that..." -Participant 3, Geneticist. "... [the older adults], they have trouble grasping the genetic concepts [by telehealth] and I think partly because they might not be that interested at this point in their lives." -Participant 2, Genetic Counselor. Some providers reported attempting to provide equitable services by using visual aids or adjusting how they explain concepts. "There are some times where you can assess that maybe your description is a little too high level, so then you need to break it down a little bit" -Participant 5, Genetic Counselor.

In some cases, participants believed the effectiveness of telehealth consultations were similar, if not equal, to traditional in-person genetic services, and patients appreciated the practical benefits of telehealth. "... I think for most people the convenience widely outweighs any difference in the quality of care that they would get." -Participant 8, Genetic Counselor. One participant discussed how

in-person consultations did not seem valuable, at times. "It really didn't feel like the value was there in some of those [in-person] sessions. [Telehealth] just felt reasonable ... It just feels like you're ... able to take one thing off their plate by saying like, "Don't worry about it. I'll just give you a call." -Participant 8, Genetic Counselor. Understanding Telehealth Limits.

The participants in the study acknowledged the limits inherent to telehealth services. Telehealth was not portrayed as ideal for every patient. It was a main means of care for many patients, but an adjunctive service for others. Participants recounted how telehealth did not allow for the same flow of conversation, especially during group discussions, as traditional face-to-face consultations. In addition, nonverbal signals were lost during telephone counseling. "... I would say for me the biggest difference is not being able to see those visual cues." -Participant 10, Genetic Counselor.

Study participants stated that telehealth practice requires a strong internet or phone connection on the part of the patient and provider, which is prone to intermittent connection issues. "[A technology issue] usually is internet-related more than anything else." -Participant 8, Genetic Counselor. In addition, participants thought telehealth may be more favorable to patients based on the modality (e.g., phone versus video). "... if patients were given the choice [between phone or video] what they would choose ... I would say it would probably either be a tie or phone might come out a little bit on top only because a phone gives them more flexibility in terms of when they could take the appointment." -Participant 10, Genetic Counselor.

Participants expressed awareness of potential communication and connection issues and limitations with telehealth. Among study participants there was an acceptance that telehealth could alter their "gestalt" of patients, not seeing participants' cues ordinarily assumed during in-person sessions. Troubleshooting and prompt resolution of technical issues and previous experience using telehealth were all factors related to their comfort and confidence using telehealth with patients.

3.4 | Feelings about telehealth consultations

Several participants expressed that they experienced telehealth consultations differently than traditional in-person consultations. A number of participants felt their telehealth consultations to be more personal or that they had a more intimate connection with the patient when patients were in their own home compared to the more public location of the clinic. "... having a personal laptop and a personal monitor and being closer even to the laptop felt that I was closer to the family. And then when they were at home, it did feel more intimate." -Participant 3, Geneticist. In contrast, a number of participants felt the same using telehealth compared to in-person consultations. "I think you meet patients in all different stages of their journey, whether it's a family history or a cancer journey. I feel that's pretty much the same over the phone versus in person. Haven't really felt too much of a difference" -Participant 6,

Genetic Counselor. Other participants felt not being in front of the patient made consultations feel less intimate. "... it's a little bit more anonymous so it's a voice over the phone but you don't have a face with the voice." -Participant 10, Genetic Counselor.

Participants weighed how they felt about telehealth work as a contrast to their experiences of in-person consultations. According to one participant, "... it [telehealth] really is a very good supplement. It's not a replacement for in-person care. There are some patient encounters that you will never be able to replace person to person with telehealth, but I think for a lot of individuals telehealth has the opportunity to be a really, really good supplement ... For some patients it literally may be their only way to access genetic services and I don't think it should be overlooked" -Participant 10, Genetic Counselor.

3.5 | Deepening personal fulfillment

All participants felt fulfilled by the clinical care they delivered via telehealth. Providers expressed the importance of their telehealth work and pride in the services they were able to give to patients in need. "I am [fulfilled]... it was very clear I need to be working with patients." -Participant 7, Genetic Counselor. "I do think in general it is very rewarding." -Participant 8, Genetic Counselor. Most participants reported fulfillment from non-patient care responsibilities associated with their position as well. In addition to documentation required for clinical genetic services, many telehealth providers were able or required to have other non-patient facing roles within their organization, including but not limited to, special projects, student supervision and training, research involvement, and social media content creation. "I am [fulfilled]. I work with the team for a lot of different things. I have participated in this creation and execution of [my employer's] survey, which I think is really useful." -Participant 9, Genetic Counselor.

3.6 | Theory

Analysis of the qualitative data revealed the Theoretical Model of Telehealth Providers in Genetics, shown in Figure 1. The model demonstrates the integration of processes of telehealth in clinical

genetics delivery from the perspective of providers with the inter-related themes identified in the analysis. This leads to the central theme in the model, identified by study participants as effective genetic services. Anchoring the model at the beginning of the process is provider decision making, actively choosing telehealth as a vocation and the healthcare organization supporting this platform for genetic services. Increasing provider access is a driver of effective genetic services which allows positive feedback for provider fulfillment and an impetus to provide continuing effective genetic services. Knowledge of provider feelings about the telehealth service delivery model and acknowledgment and adaptation to the limits of telehealth may temper genetic service delivery, but also impel effective services. This model indicates a dynamic relationship between the personal and professional self and ultimately revealed providers' interests in telehealth as reflected in their choices, which are personal and intrinsic in nature, but drive accessible, effective clinical genetic services for patients.

4 | DISCUSSION

This inquiry provides a deeper understanding of the telehealth experience from the perspectives of the genetics providers who participated in the study. Of note, data collection and analysis for this study took place on the cusp and during the initial wave of SARS-CoV-2 in the United States in early 2020 when fewer healthcare providers were engaged in telehealth consultations. We expect that the lessons learned from this research will be useful in appreciating different aspects of telehealth work and the recruitment and retention of personnel for genetic telehealth.

4.1 | Provider choices

Participants were intentional when choosing their current telehealth position namely to promote balance and flexibility in their lives, which was similar to findings of other healthcare research (Honigman, 2017; Yester, 2019). The providers in this study, average age 37.70 ± 7.96 years, may be more attracted to or likely to accept positions which align with factors important to younger generations,

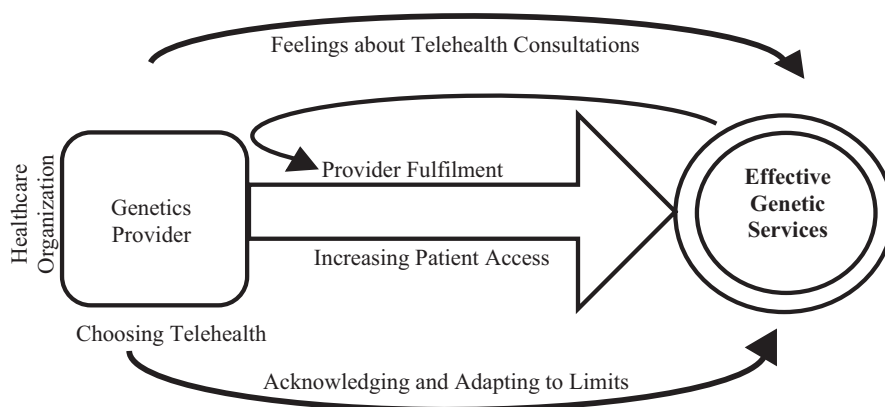


FIGURE 1 Theoretical model of telehealth providers in genetics

including career-life balance, belonging, and meaningful work (Calk & Patrick, 2017). Working within a non-traditional service delivery model appealed to genetics providers in this study. Genetics providers are expected to be early adopters of novel technology, including offering new genetic tests for clients (Arora et al., 2016). Genetics providers also work with early adopters of technology, including clients who avail themselves of personalized genetic testing and medicine (Lopes et al., 2019). It has been suggested that genetic counselors may have unique personal characteristics which allow them to be flexible and embrace new areas of practice (Davis et al., 2020).

4.2 | Patient access & provider availability

Increasing patient access was cited as the number one motivator for the use of telehealth in patient care, consistent with the overarching mission of other telehealth programs (Johns Hopkins Medicine, 2020; Penn Medicine, 2020). Participants discussed how telehealth provides increased access and minimizes typical patient barriers such as driving to the destination and time out of work, as noted in previous studies (Penon-Portmann et al., 2020; Rhoades & Rakes, 2020). Providers also reported the ability to see more patients at more flexible hours in often less time due to the focused nature of some telehealth consultations. In most cases, patient access through telehealth was discussed as a goal of one's employer. The implementation of telehealth was considered an organization-level rather than provider-level decision. As only one participant spearheaded the implementation of telehealth at their organization, there was a less personal connection to the "why" behind participants' respective telehealth program.

4.3 | Telegenetics effectiveness and limits

Providers reported being comfortable with the telehealth process and believed they were delivering effective services to patients. This sentiment is consistent with previous telehealth literature in genetics and other specialties (Vrečar et al., 2017; Whitten et al., 2010). The measurement of effectiveness varied by participant. Participants commonly reported patient feedback during or after their consultation, as an important measure of consultation effectiveness. Genetics providers were also able to gauge their effectiveness through perceived patient understanding and valuing of their services. This finding is consistent with research in clinical training of non-genetics specialties. For example, Lai et al. (2014) demonstrated patient feedback as a successful data point to improve consultations for medical students. Related, genetics providers in this study reported that their clinic experiences shaped their comfort level with telehealth. Thus, provider experience may be the salient factor considered in telehealth effectiveness. Participants were aware of the limitations of telehealth and the potential decrease in clinical effectiveness, consistent with previous research in clinical genetics (Hilgart et al., 2012; Vrečar et al., 2017). It is not known

whether there were appreciable differences in opinion among study participants who used video or audio media exclusively or a combination of both. Attitudes toward technology and technological failure were pragmatic per the participants and considered part of the telehealth experience. Fortunately, improving technology and widespread phone and internet service throughout even rural areas of the United States, part of the bipartisan infrastructure bill is anticipated to mitigate many connectivity issues (Campbell et al., 2021).

4.4 | Feelings about telehealth consultations

Participants reported emotional responses to the telehealth process and their patients resulting from telehealth consultations. Participants expressed a variety of reactions to patients resulting from telehealth work ranging from more intimate connectedness to feelings of less personal relations with patients, as described in previous studies (Iredale et al., 2002; Zilliagus et al., 2010). For others, telehealth consultations seemed no different when compared to traditional in-person consultations. These differences in feeling connected may be related to the different types of genetic services provided, indications for consultation, organizational differences, and/or patient or provider personalities. Feelings of fulfillment with patient interactions were high in this participant group, which was consistent with professional satisfaction measures for genetic counselors (NSGC Professional Status Survey: Executive Summary, 2020; Zierhut et al., 2018). Telehealth may allow more time for providers to attend to creative work or clinical research, which may serve as a source of satisfaction. Participants reported higher levels of fulfillment with non-patient care when individuals were able to pursue other projects, outside of regular documentation and administrative tasks. Thus, role diversification among telehealth and other positions in genetics may be important to overall provider fulfillment.

4.5 | Theoretical model of telehealth providers in genetics

The Theoretical Model of Telehealth Providers in Genetics (Figure 1) illustrates the themes at work for genetics providers which drive effective services for patients. Each theme of the model contributes to the end point which is effective genetic services. It is important to consider how malleable the model may be if the structural components change, weaken, or are missing. For example, if a provider's healthcare organization is a barrier to the telehealth process, this could have a negative impact on provider fulfillment as well as patient care. Similarly, if providers perceive their services to be ineffective, this could have a negative effect on provider fulfillment. However, it may also drive providers to fine-tune their service delivery to become more effective, which would have a positive impact on care delivery and provider fulfillment in the future. Thus, provider self-regulation of performance may be related to perceptions of effective services as suggested in the model.

4.6 | Implications for practice

The results of this study indicate that genetics providers perceive their telehealth work to be positive and beneficial to patients due to increased access and effective service. These findings support the growth of telehealth in clinical genetics as an adjunct or replacement to traditional clinical genetic services. Importantly, findings from this study can help guide new telehealth programs which are urgently needed and may be expanded with the SARS-CoV-2 pandemic continuance. Organizations are encouraged to rethink service delivery models to mitigate a variety of public health concerns, ranging from lack of genetic services to delivering care during global pandemics. How are U.S. healthcare systems affecting telehealth provider experiences and care delivery? Telehealth is highly popular and may be here to stay, but some insurers are rolling back coverage for providers using telehealth with uneven reimbursement for services (Gantz, 2021). Alternatively, a bright note is that Medicare is expanding coverage for telehealth for older adults (Span, 2021).

We do not know how long SARS-CoV-2 will be with us or if we are experiencing a new normal in healthcare. The authors acknowledge this grounded theory study may not capture all facets of telehealth work. New research has emerged because of the pandemic which considers the place of genetic services in telehealth and is a welcome addition to the growing literature of genetic telehealth. These studies include research of the before and after telehealth experiences of genetic counselors in SARS-CoV-2 (Mills et al., 2021), telehealth experiences across specialties in Nebraska (Rezich et al., 2021), the U.S. and Canada (Ma et al., 2021) and more. A recent SARS-CoV-2 impact study conducted by the National Society of Genetic Counselors SARS-CoV-2 Impact Survey Working Group Survey identified a significant shift in patient care provided via telehealth, accompanied by pitfalls in reimbursement for services (Pan et al., 2021). Additional research is needed to explore issues in payment for genetics work and counseling delivery.

The majority of this study's sample is genetic counselors. Given this composition, the discussed theoretical model is guided by genetic counseling practice and may not apply to other clinical genetics providers. Future inquiries could focus on the multifaceted genetic workforce including specific genetic specialties to highlight potential process variations in the clinical genetics field for the provision of effective education and information, patient counseling, and self-regulation. These topics can be examined through additional qualitative and quantitative work, including the development of validated measures to assess the effectiveness of telegenetics consultations and other constructs of the Theoretical Model of Telehealth Providers in Genetics.

ACKNOWLEDGEMENTS

This work was performed in partial fulfillment of the first author's requirements for the degree Doctor of Philosophy. We acknowledge Dr. Ashley Cannon, Dr. Stephanie Davis, and Dr. Kaitlan Beretich for their thoughtful review of this manuscript. We thank the participants for generously sharing their experiences.

AUTHOR CONTRIBUTIONS

Lauren A. Beretich: Study conception and design, methodology development, interviews, analysis and interpretation of data, drafting and revising the work, responsibility for the integrity of this study and correspondence. Sara M. Sarasua: Data analysis, interpretation of data, drafting and revising the work, and responsibility for integrity of the study. Jane M. DeLuca: Study conception and design, methodology development, interviews, analysis and interpretation of data, drafting and revising the work, and responsibility for the integrity of this study.

COMPLIANCE WITH ETHICAL STANDARDS

CONFLICT OF INTEREST

The authors declare no conflict of interest.

HUMAN STUDIES AND INFORMED CONSENT

Approval to conduct this human subjects research was obtained by the Clemson University Institutional Review Board. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants for being included in the study.

ANIMAL STUDIES

No non-human animal studies were carried out by the authors related to this study.

DATA AVAILABILITY STATEMENT

All salient data for analysis and theory development for this study are included in this manuscript.

ORCID

Lauren A. Beretich  <https://orcid.org/0000-0002-8709-3160>

REFERENCES

- Arora, S., Haverfield, E., Richard, G., Haga, S. B., & Mills, R. (2016). Clinical and counseling experiences of early adopters of whole exome sequencing. *Journal of Genetic Counseling*, 25, 337–343. <https://doi.org/10.1007/s10897-015-9876-y>
- Boothe, E., West, B., Hendon, L. G., Kaplan, J. D., & Kirmse, B. (2021). Asynchronous telemedicine for clinical genetics consultations in the NICU: A single center's solution. *Journal of Perinatology*, 42(2), 262–268. <https://doi.org/10.1038/s41372-021-01070-1>
- Calk, R., & Patrick, A. (2017). Millennials through the looking glass: Workplace motivating factors. *The Journal of Business Inquiry*, 16, 131–139.
- Campbell, S., Castro, R. J., & Wessel, D. (2021). *The benefits and costs of broadband expansion*. Brookings. <https://www.brookings.edu/blog/up-front/2021/08/18/the-benefits-and-costs-of-broadband-expansion/>
- Charmaz, K. (2014). *Constructing grounded theory*, 2nd ed. SAGE Publications.
- Committee On Pediatric Workforce, Rimsza, M. E., Hotaling, A. J., Keown, M. E., Marcin, J. P., Moskowitz, W. B., Sigrest, T. D., &

- Simon, H. K. (2015). The use of telemedicine to address access and physician workforce shortages. *Pediatrics*, 136(1), 202–209. <https://doi.org/10.1542/peds.2015-1253>
- d'Agincourt-Caning, L., McGillivray, B., Panabaker, K., Scott, J., Pearn, A., Ridge, Y., & Portigal-Todd, C. (2008). Evaluation of genetic counseling for hereditary cancer by videoconference in British Columbia. *British Columbia Medical Journal*, 50, 554–559.
- Danylchuk, N. R., Cook, L., Shane-Carson, K. P., Cacioppo, C. N., Hardy, M. W., Nusbaum, R., Steelman, S. C., & Malinowski, J. (2021). Telehealth for genetic counseling: A systematic evidence review. *Journal of Genetic Counseling*, 30(5), 1361–1378. <https://doi.org/10.1002/jgc4.1481>
- Davis, C., Baty, B. J., Hippman, C., Trepanier, A., & Erby, L. (2020). Genetic counselors with advanced skills: II. A new career trajectory framework. *Journal of Genetic Counseling*, 29, 771–785. <https://doi.org/10.1002/jgc4.1204>
- Donelan, K., Barreto, E. A., Sossong, S., Michael, C., Estrada, J. J., Cohen, A. B., & Schawamm, L. H. (2019). Patient and clinician experiences with telehealth for patient follow-up care. *American Journal of Managed Care*, 25(1), 40–44.
- Gantz, S. (2021). *Telemedicine is here to stay, but how much you pay for a visit could change*. *The Philadelphia Inquirer*. <https://www.inquirer.com/health/consumer/coronavirus-covid-19-telehealth-virtualvisits-insurance-coverage-20210929.html>
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*, 1st ed. Aldine Publishing.
- Hilgart, J. S., Hayward, J. A., Coles, B., & Iredale, R. (2012). Telegenetics: A systematic review of telemedicine in genetics services. *Genetics in Medicine*, 14, 765–776. <https://doi.org/10.1038/gim.2012.40>
- Honigman, B. (2017). Work-life balance: Is it possible to achieve? *Journal of Emergency Medicine*, 53, 924–925. <https://doi.org/10.1016/j.jemermed.2017.08.031>
- Iredale, R., Gray, J., & Murtagh, G. (2002). Telegenetics: A pilot study of video-mediated genetic consultations in Wales. *Journal of Medical Marketing*, 2, 130–135. <https://doi.org/10.1057/palgrave.jmm.5040066>
- Johns Hopkins Medicine (2020). *TeleGenetics program*. https://www.hopkinsmedicine.org/heart_vascular_institute/cardiology/arvd/clinical_services.html
- Johnson, K., Davies, J., & Caleshu, C. (2020). Increasing scale and throughput of telehealth genetic counseling across the spectrum of reproductive care, while maintaining high patient satisfaction. *Fertility and Sterility*, 114(3), E237. <https://doi.org/10.1016/j.fertnstert.2020.08.664>
- Lai, M. M. Y., Roberts, N., & Martin, J. (2014). Effectiveness of patient feedback as an educational intervention to improve medical student consultation (PTA Feedback Study): Study protocol for a randomized controlled trial. *Trials*, 15, e1–5. <https://doi.org/10.1186/1745-6215-15-361>
- Lopes, M. A. C. Q., de Oliveira, G. M. M., Ribeiro, A. L. P., Pinto, F. J., Rey, H. C. V., Zimmerman, L. I., & de Rezende, W. F. (2019). Guideline of the Brazilian society of cardiology on telemedicine in cardiology - 2019. *Arquivos Brasileiros De Cardiologia*, 113, 1006–1056. <https://doi.org/10.5935/abc.20190205>
- Ma, D., Ahimaz, P. R., Mirocha, J. M., Cook, L., Giordano, J. L., Mohan, P., & Cohen, S. A. (2021). Clinical genetic counselor experience in the adoption of telehealth in the United States and Canada during the COVID-19 pandemic. *Journal of Genetic Counseling*, 30, 1214–1223. <https://doi.org/10.1002/jgc4.1516>
- Maiese, D. R., Keehn, A., Lyon, M., Flannery, D., Watson, M., & Working Groups of the National Coordinating Center for Seven Regional Genetics Service Collaboratives (2019). Current conditions in medical genetics practice. *Genetics in Medicine*, 21(8), 1874–1877. <https://doi.org/10.1038/s41436-018-0417-6>
- Mills, R., MacFarlane, I. M., Caleshu, C., Ringler, M. A., & Zierhut, H. A. (2021). Genetic counselor experiences with telehealth before and after COVID-19. *Journal of Genetic Counseling*, 30, 999–1009. <https://doi.org/10.1002/jgc4.1465>
- Moore, M. A., Coffman, M., Jetty, A., Klink, K., Petterson, S., & Bazemore, A. (2017). Family physicians report considerable interest in, but limited use of, telehealth services. *Journal of the American Board of Family Medicine*, 30, 320–330. <https://doi.org/10.3122/jabfm.2017.03.160201>
- Nazareth, S., Nussbaum, R. L., Siglen, E., & Wicklund, C. A. (2021). Chatbots & artificial intelligence to scale genetic information delivery. *Journal of Genetic Counseling*, 30, 7–10. <https://doi.org/10.1002/jgc4.1359>
- NSGC Professional Status Survey: Executive Summary (2020). p. 15. <https://www.nsgc.org/Policy-Research-and-Publications/Professional-Status-Survey>
- Otten, E., Birnie, E., Ranchor, A. V., & van Langen, I. M. (2016). Online genetic counseling from the providers' perspective: Counselors' evaluations and a time and cost analysis. *European Journal of Human Genetics*, 24, 1255–1261. <https://doi.org/10.1038/ejhg.2015.283>
- Pan, V., Doerr, M., Hoell, C., Ryan, L., Erwin, D. J., Hooker, G., & Haverty, C. & The National Society of Genetic Counselors GC SARS-CoV-2 Impact Survey Working Group (2021). Results of the genetic counselor SARS-CoV-2 impact survey from the National Society of Genetic Counselors: Progress and penalty during the COVID-19 pandemic. *Journal of Genetic Counseling*, 30(4), 989–998. <https://doi.org/10.1002/jgc4.1484>
- Penn Medicine (2020) *Telegenetic counseling*. <https://healthcareinnovation.upenn.edu/projects/telegenetic-counseling>
- Penon-Portmann, M., Chang, J., Cheng, M., & Shieh, J. T. (2020). Genetics workforce: Distribution of genetics services and challenges to health care in California. *Genetics in Medicine*, 22, 227–231. <https://doi.org/10.1038/s41436-019-0628-5>
- Rezich, B. M. Z., Malone, J. A., Reiser, G., Zimmerman, H. H., Blase, T. L., & Fishler, K. P. (2021). Telehealth genetic services during the COVID-19 pandemic: Implementation and patient experiences across multiple specialties in Nebraska. *Journal of Genetic Counseling*, 30, 1233–1243. <https://doi.org/10.1002/jgc4.1507>
- Rhoades, S., & Rakes, A. L. (2020). Telehealth technology: Reducing barriers for rural residents seeking genetic counseling. *Journal of the American Association of Nurse Practitioners*, 32, 190–192. <https://doi.org/10.1097/JXX.0000000000000373>
- Solomons, N. M., Lamb, A. E., Lucas, F. L., McDonald, E. F., & Miesfeldt, S. (2018). Examination of the patient-focused impact of cancer telegenetics among a rural population: Comparison with traditional in-person services. *Telemedicine Journal and e-Health*, 24, 130–138. <https://doi.org/10.1089/tmj.2017.0073>
- Span, P. (2021). *Telehealth became a lifeline for older Americans. But it still has glitches*. *The New York Times* <https://www.nytimes.com/2021/12/11/health/telehealth-medicare-covid.html>
- Stark, Z., Dolman, L., Manolio, T. A., Ozenberger, B., Hill, S. L., Caulfield, M. J., & North, K. N. (2019). Integrating genomics into healthcare: A global responsibility. *American Journal of Human Genetics*, 104(1), 13–20. <https://doi.org/10.1016/j.ajhg.2018.11.014>
- Voils, C. I., Venne, V. L., Weidenbacher, H., Sperber, N., & Datta, S. (2018). Comparison of telephone and televideo modes for delivery of genetic counseling: A randomized trial. *Journal of Genetic Counseling*, 27, 339–348. <https://doi.org/10.1007/s10897-017-0189-1>
- Vrečar, I., Hristovski, D., & Peterlin, B. (2017). Telegenetics: An update on availability and use of telemedicine in clinical genetics service. *Journal of Medical Systems*, 41(2), 1–4. <https://doi.org/10.1007/s10916-016-0666-3>
- Wechsler, L. R., Demaerschalk, B. M., Schwamm, L. H., Adeoye, O. M., Audebert, H. J., Fanale, C. V., Hess, D. C., Majersik, J. J., Nystrom, K. V., Reeves, M. J., Rosamond, W. D., Switzer, J. A., & Council on Quality of Care and Outcomes Research (2017). Telemedicine quality and outcomes in stroke: A scientific statement for healthcare

- professionals from the American Heart Association/American Stroke Association. *Stroke*, 48(1), 3–25. <https://doi.org/10.1161/STR.000000000000114>
- Whitten, P., Holtz, B., & LaPlante, C. (2010). Telemedicine: What have we learned? *Applied Clinical Informatics*, 1, 132–141. <https://doi.org/10.4338/ACI-2009-12-R-0020>
- Yester, M. (2019). Work-life balance, burnout, and physician wellness. *The Health Care Manager*, 38, 239–246. <https://doi.org/10.1097/HCM.0000000000000277>
- Zierhut, H. A., MacFarlane, I. M., Ahmed, Z., & Davies, J. (2018). Genetic counselors' experiences and interest in telegenetics and remote counseling. *Journal of Genetic Counseling*, 27, 329–338. <https://doi.org/10.1007/s10897-017-0200-x>
- Zilliagus, E., Meiser, B., Lobb, E., Dudding, T. E., Barlow-Stewart, K., & Tucker, K. (2010). The virtual consultation: Practitioners' experiences of genetic counseling by videoconferencing in Australia.

Telemedicine Journal and e-Health, 16, 350–357. <https://doi.org/10.1089/tmj.2009.0108>

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Beretich, L. A., Sarasua, S. M., & DeLuca, J. M. (2022). Genetics providers' experiences using telehealth: A grounded theory approach. *Journal of Genetic Counseling*, 31, 1155–1163. <https://doi.org/10.1002/jgc4.1586>