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Attitudes Toward Use of an *APOL1* Genetic Testing Chatbot in Living Kidney Donor Evaluation: A Focus Group Study

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ABSTRACT

Background: Living kidney donor (LKD) candidates of African ancestry are increasingly asked to undergo *Apolipoprotein* L1 (*APOL1*) genetic testing during the donor evaluation process to better understand their risk of kidney disease. LKD candidates' attitudes about using a clinical chatbot on *APOL1* remain unknown. This study builds on prior work to culturally adapt the Gia (Genetic Information Assistant) chatbot on *APOL1* by assessing donor, recipient, and community member attitudes about the Gia chatbot for enhancing the integration of *APOL1* testing into the LKD clinical evaluation workflow.

Methods: This study involved focus groups and a post-focus group survey in two US cities about the *APOL1* Gia chatbot. Qualitative data were analyzed via thematic analysis, and descriptive statistics were used for demographic data.

Results: We conducted 10 focus groups including 54 participants (25 LKDs, 23 community members, and 6 living donor kidney transplant recipients of African ancestry). Five themes emerged: (1) participants supported LKD candidates using the Gia chatbot before the nephrologist clinic visit, (2) participants were interested in undergoing *APOL1* testing after using Gia, (3) *APOL1* testing costs may influence LKD candidates' willingness to get tested, (4) patients of African ancestry may hold varying preferences for using chatbots in the healthcare setting, and (5) individual-level barriers may limit the use of Gia in the healthcare setting.

Conclusions: Individuals of African ancestry were highly receptive to integrating the *APOL1* chatbot into LKD candidate clinical evaluation, which bodes well for integrating chatbots into the *APOL1* clinical genetic testing process.

Abbreviations: APOL1, *Apolipoprotein* L1; Gia, genetic information assistant; IRB, Institutional Review Board; LKD, living kidney donor; OPTN, Organ Procurement and Transplant Network.

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1 | Introduction

Living donation poses risks to living kidney donors (LKDs) including kidney failure post-donation [1, 2]. Black/African American LKDs have a higher risk of kidney failure than White LKDs post-donation [1, 3]. Evidence suggests that two *Apolipoprotein* L1 (*APOL1*) gene risk variants contribute to adverse donor outcomes, given their significant association with kidney failure, prominently among individuals of African ancestry [4, 5].

Clinical practice guidelines suggest that *APOL1* genotyping be offered to LKD candidates of sub-Saharan African ancestry (hereafter "African ancestry") and recommend shared decision-making about donation for LKDs with two risk variants [6]. Consequently, *APOL1* genetic testing is increasingly used in LKD evaluation [7, 8] to better assess the risk of kidney disease and protect the safety of LKD candidates of African ancestry [8]. The presence of two *APOL1* risk variants can comprise a relative contraindication to donation, requiring careful counseling and consent of LKDs [9]. However, many nephrologists lack the requisite knowledge to counsel LKDs about *APOL1* genetic test results [7]. Insufficient genetic counseling referrals and the absence of genetic counselors in many hospitals hinder patients' access to genetic services [10, 11].

An innovative communication technology to circumvent the aforementioned limitations is the "clinical chatbot," designed to simulate conversation with the user [12]. Chatbots undertake the information-giving responsibilities of genetic counselors and other clinical providers, contributing to their growing use in healthcare and genetic services delivery [12, 13]. Chatbot use can effectively increase knowledge of and satisfaction with decisions about genetic testing, informed decision-making, preconception risks, and self-care [14–16].

To date, no LKD- or *APOL1*-targeted chatbot has been used in LKD evaluation. LKD candidates' attitudes toward chatbots remain unknown. This is of significance given the history of medical/genetic abuses against Black/African American patients and distrust in providers [17]. We previously culturally adapted a Health Insurance Portability and Accountability Act-compliant clinical chatbot, Gia (Genetic Information Assistant) to *APOL1* and LKD candidates of African ancestry [18]. The present study builds on our prior work by assessing attitudes toward using our chatbot for LKD evaluation, as attitudes may impact chatbot integration into LKD clinical evaluation workflow.

2 | Methods

2.1 | Study Design

This cross-sectional study entailed sequential focus groups and post-focus group surveys about using an *APOL1* chatbot, as part of a broader study evaluating the integration of a culturally competent *APOL1* genetic testing program into LKD candidate clinical evaluation [19]. The study was conducted at Northwestern University (NU) in Chicago, IL and Georgetown University (GU) in Washington, DC. We described how sites were selected elsewhere [19]. The Institutional Review Boards (IRB) approved the study at NU (STU00214038, IRB of record) and GU (STUDY00003752). Verbal informed consent was obtained prior to participation. We used the Consolidated Criteria for Reporting Qualitative Research for quality reporting [20].

Briefly, our *APOL1* Gia chatbot was designed to improve the informed decision-making process for pre-genetic testing of LKD candidates of African ancestry [18]. Content for the chatbot derived from the *APOL1* literature, and expert knowledge by transplant nephrologists, genetic counselors, and social scientists on our research team. The research team, our scientific advisory board, and the community advisory board reviewed multiple drafts of the Gia script to ensure its accuracy, relevancy, comprehension, and cultural sensitivity, as described in detail elsewhere [18]. The chatbot includes information on foundational concepts in human genetics and kidney disease, the association between high-risk *APOL1* variants and kidney disease, the prevalence of *APOL1* risk variants, the impact of homozygous test results on kidney donation, indications for *APOL1* genetic testing, and the Genetic Information Nondiscrimination Act.

2.2 | Study Population and Recruitment

Eligible individuals included English-speaking adult (age 18+ years) community members, LKDs, or LKD transplant recipients of African ancestry. Eligible LKDs or transplant recipients who donated or received a kidney within the previous 15 years were identified by medical record review. We prioritized recruitment of LKDs who had donated within the past year and performed a stratified random sample by gender to recruit equal numbers of male and female LKDs and KTRs. Only GU recruited LKD transplant recipients.

LKDs and transplant recipients were recruited by mailed letter and/or email, followed by a phone call, to screen for eligibility, assess interest, and obtain informed consent. Community members contacted the research staff directly, after viewing study flyers distributed by our Community Advisory Board.

2.3 | Data Collection

Data collection was systematic by consistently applying the same data collection protocols and documenting all steps [21]. Moderators trained by a seasoned qualitative researcher (E.J.G.) led videoconference focus groups using standard focus group procedures [22]. Focus groups began by providing background information about living kidney donation, *APOL1*, and kidney disease, and the purpose of the chatbot, ensuring that participants had sufficient foundational knowledge. Thereafter, we provided participants the link to use Gia for 8 min. We then assessed first impressions of Gia and sought input on specific sections of the chatbot script, study design, and cultural sensitivity, the results of which were reported elsewhere [23]. Subsequently, we asked open-ended questions to assess perceptions of barriers to using Gia in a healthcare setting; the prospect of LKD candidates using Gia before their nephrologist visit; how patients of African ancestry would feel using a comparable chatbot; among factors reported elsewhere [18]. Upon concluding, we asked 9–10 focus groups: "After going through the entire chat, would using Gia make you want to get the *APOL1* genetic test?" This question was added to the moderator's guide after the first group. Thereafter, participants completed an online survey of demographic characteristics, including three questions to assess ancestry [24–27]. We conducted $n = 10$ focus groups in order to reach saturation of themes; saturation of themes regarding the chatbot script took longer than usual given our iterative chatbot design changes made over time [28]. Focus groups lasted approximately 120 min and were audio-recorded, which generated extensive in-depth data. Participants were compensated with a $50 e-gift card.

2.4 | Data Analysis

All focus group recordings were transcribed verbatim and analyzed for themes emergent from the data using constant comparison and inductive and deductive coding methods [29]. An a priori list of defined codes corresponding to focus group questions was developed. Responses were coded using NVivo qualitative software (QSR International). We (E.J.G., J.G.-S., and R.Y.) used a rapid, iterative process to independently review and openly code three transcripts [30, 31]. After coding each transcript, we revised the coding scheme by adjusting for new responses, with modified codes applied to prior transcripts, until reaching thematic saturation (when no new themes emerged from the data) [32]. Transcripts were coded after inter-rater reliability was established (Kappa > 0.80) [33]. Thereafter, all segments pertaining to each code were reviewed, and analytic summaries were developed that synthesized emergent patterns [30, 31]. The credibility of our interpretations was attained by reaching thematic saturation, engaging in thick description, practicing reflexivity, and engaging in investigator triangulation [34].

Descriptive statistics were used to analyze the post-focus group survey and demographic data. Means, standard deviations, and frequencies were calculated using IBM SPSS Statistics 28.

3 | Results

3.1 | Demographics

We conducted ten focus groups (Chicago $n = 5$; Washington, DC $n = 5$) with $n = 54$ participants. Participants included: LKDs ($n = 5$ groups, $n = 25$ participants, 46%), community members ($n = 4$ groups, $n = 23$ participants, 43%), and LKD transplant recipients ($n = 1$ focus group, $n = 6$ participants, 11%). Most participants were female (72%), with an average age of 44 years (Table 1). Seven LKDs (at NU) declined to participate in the study.

3.2 | Thematic Analysis

Five themes emerged: (1) participants supported LKD candidates using Gia before nephrologist clinic visits, (2) participants were interested in undergoing *APOL1* testing after using Gia, (3) *APOL1* testing costs may influence LKD candidates' willingness to get tested, (4) patients of African ancestry may vary in potential preferences for using chatbots in the healthcare setting, and (5) individual-level barriers may limit the use of Gia in the healthcare setting. Table 2 presents illustrative, representative quotations.

3.2.1 | Support for LKD Candidates Using the *APOL1* Chatbot Before the Nephrologist Clinic Visit

Focus groups with LKDs assessed attitudes about LKD candidates using Gia before their nephrology clinic visit. Participants supported the idea of LKD candidates using the chatbot to obtain basic information before meeting with their transplant nephrologist. Participants considered Gia as a "good tool" and "good resource" for LKD candidates to use "while they're waiting for their appointment." Some participants considered chatbot use in the clinic as a way to prepare LKD candidates for their appointment by providing "detailed information on what to expect." Participants also recognized that Gia could "stimulate you" and "may lead you to questions you didn't know you had or needed to ask," giving LKD candidates "talking points" for their meeting with the nephrologist.

3.2.2 | Interest in Undergoing *APOL1* Testing After Using Gia

Nine focus groups were asked about their preferences for *APOL1* genetic testing. Participants expressed strong interest in undergoing *APOL1* testing after using Gia. One participant stated, "The conversation was so convincing, at the end of the conversation I was so much into, like, I would really love to have the *APOL1* testing. It really convinced me that I really needed one." A LKD participant who expressed interest in *APOL1* testing wished the chatbot "was actually available when I donated my kidney," and mentioned that Gia "would be good for people who are going through the [living donor] process." However, several participants noted that while they would likely undergo *APOL1* testing, they needed additional information before deciding. One participant expressed the desire for having "…as much information as I can, [to] make an informed decision about whether or not this is something I want to do."

3.2.3 | Influence of *APOL1* Genetic Testing Costs on Willingness to Get Tested

Nine focus groups expressed concern regarding *APOL1* genetic testing costs. Participants related that costs would influence LKD candidates' willingness to undergo testing. Many participants stated that knowing the *APOL1* test was free would encourage testing. One participant said they would "expect that it would be free" so that LKD candidates could be informed and "consider all the risks." Conversely, a few participants reported that *APOL1* testing costs would not influence their decision to undergo testing as they would want *APOL1* testing "whether it's free or not," "even if you charge my insurance for it," and "if I have to pay." Participants would be motivated to get tested regardless of cost "so I have the knowledge," "to see where I stand or [if] I can be a donor," and to get "information long-term regarding [the donor's] health."

TABLE 1 | Focus group participant demographic characteristics.

Characteristic	Total *N* = 54 *n* (%)	NU *n* = 30 *n* (%)	GU *n* = 24 *n* (%)
Age, years, mean (SD), (range)	43.8 (13.8) [21–68]	39.7 (15.3) [21–68]	48.9 (9.87) [27–62]
20–29	14 (25.9)	12 (40.0)	2 (8.3)
30–39	7 (13.0)	4 (13.3)	3 (12.5)
40–49	10 (18.5)	5 (16.7)	5 (20.8)
50–59	17 (31.5)	6 (20.0)	11 (45.8)
60–69	6 (11.1)	3 (10.0)	3 (12.5)
Sex			
Female	39 (72.2)	18 (60.0)	21 (87.5)
Male	15 (27.8)	12 (40.0)	3 (12.5)
Highest education level			
High school graduate	3 (5.6)	3 (10.0)	0 (0)
Some college	13 (24.1)	3 (10.0)	10 (41.7)
College graduate	28 (51.9)	19 (63.3)	9 (37.5)
Postgraduate degree (MA, PhD, MD, DO, etc.)	10 (18.5)	5 (16.7)	5 (20.8)
Marital status			
Married/Domestic partner/Civil union/Living with partner	29 (53.7)	14 (46.7)	15 (62.5)
Separated or divorced/Never married/Single/Widowed	25 (46.3)	16 (53.3)	9 (37.5)
Ethnic identity			
Hispanic/Latino	3 (5.6)	3 (10.0)	0 (0)
Not Hispanic/Latino	51 (94.4)	27 (90.0)	24 (100)
Race			
African American/Black	52 (96.3)	29 (96.7)	23 (95.8)
Multi-racial	2 (3.7)	1 (3.30)	1 (4.2)
Awareness of biologically related family members with African ancestry			
Yes	37 (68.5)	22 (73.3)	15 (62.5)
No	17 (31.5)	8 (26.7)	9 (37.5)
Who in family has African ancestry			
Not applicable	17 (31.5)	8 (26.7)	9 (37.5)
Both parents	12 (22.2)	9 (30.0)	3 (12.5)
Entire family	9 (16.7)	2 (6.7)	7 (29.2)
Father	6 (11.1)	5 (16.7)	1 (4.2)
Mother	5 (9.3)	3 (10.0)	2 (8.3)
Self	2 (3.7)	1 (3.3)	1 (4.2)
Great (7×) grandfather	1 (1.9)	1 (3.3)	0 (0)
Unsure	1 (1.9)	0 (0)	1 (4.2)
Missing	1 (1.9)	1 (3.3)	0 (0)
Ancestry			
African	15 (27.8)	11 (36.7)	4 (16.7)
African American	12 (22.2)	5 (16.7)	7 (29.2)
Black	6 (11.1)	4 (13.3)	2 (8.3)

(Continues)

TABLE 1 | (Continued)

Characteristic	Total *N* = 54 *n* (%)	NU *n* = 30 *n* (%)	GU *n* = 24 *n* (%)
Black American	3 (5.6)	2 (6.7)	1 (4.2)
South Africa	2 (3.7)	2 (6.7)	0 (0)
Unknown	2 (3.7)	0 (0)	2 (8.3)
African American, Native American, Jewish	1 (1.9)	0 (0)	1 (4.2)
African and Irish	1 (1.9)	1 (3.3)	0 (0)
African, German, Indian	1 (1.9)	1 (3.3)	0 (0)
African and Indian	1 (1.9)	1 (3.3)	0 (0)
BIPOC	1 (1.9)	0 (0)	1 (4.2)
Cameroon and Nigeria	1 (1.9)	0 (0)	1 (4.2)
Cameroon/Congo Bantu people	1 (1.9)	0 (0)	1 (4.2)
Caribbean	1 (1.9)	0 (0)	1 (4.2)
Jamaican	1 (1.9)	0 (0)	1 (4.2)
Kenya	1 (1.9)	1 (3.3)	0 (0)
Nigeria, Ghana, Cameroon	1 (1.9)	0 (0)	1 (4.2)
Nigeria, France, Ireland, Scotland	1 (1.9)	0 (0)	1 (4.2)
Sub Saharan descent	1 (1.9)	1 (3.3)	0 (0)
No response	1 (1.9)	1 (3.3)	0 (0)
Employment status			
Employed full-time	33 (61.1)	14 (46.7)	19 (79.2)
Employed part-time	14 (25.9)	12 (40.0)	2 (8.3)
Not employed	3 (5.6)	2 (6.7)	1 (4.2)
Homemaker	2 (3.7)	0 (0)	2 (8.3)
Disabled	2 (3.7)	2 (6.7)	0 (0)
Annual income			
Less than $15,000	1 (1.9)	1 (3.3)	0 (0)
Between $15,000 and $34,999	6 (11.1)	5 (16.7)	1 (4.2)
Between $35,000 and $54,999	9 (16.7)	7 (23.3)	2 (8.3)
Between $55,000 and $74,999	12 (22.2)	7 (23.3)	5 (20.8)
Between $75,000 and $94,999	7 (13)	5 (16.7)	2 (8.3)
More than $95,000	19 (35.2)	5 (16.7)	14 (58.3)
Primary health insurance coverage			
Private health insurance	42 (77.8)	19 (63.5)	23 (95.8)
Medicaid/Medicare	10 (18.5)	10 (33.3)	0 (0)
None	2 (3.7)	1 (3.3)	1 (4.2)
Health literacy			
Adequate	52 (96.3)	28 (93.3)	24 (100.0)
Inadequate	2 (3.7)	2 (6.7)	0 (0)
Own a working smartphone			
Yes	54 (100.0)	30 (100.0)	24 (100.0)
Send or receive text messages			
Yes	54 (100.0)	30 (100.0)	24 (100.0)

(Continues)

TABLE 1 | (Continued)

Characteristic	Total *N* = 54 *n* (%)	NU *n* = 30 *n* (%)	GU *n* = 24 *n* (%)
Time spent using Internet per week			
Less than 5 h	4 (7.4)	2 (6.7)	2 (8.3)
5–10 h	8 (14.8)	4 (13.3)	4 (16.7)
10–15 h	6 (11.1)	2 (6.7)	4 (16.7)
15–20 h	9 (16.7)	7 (23.3)	2 (8.3)
More than 20 h	27 (50.0)	15 (50.0)	12 (50.0)
Registered as an organ donor			
Yes	36 (66.7)	19 (63.3)	17 (70.8)
No	18 (33.3)	11 (36.7)	7 (29.2)

Abbreviation: SD, standard deviation.

3.2.4 | Patients of African Ancestry May Hold Varying Preferences atpbout Using Healthcare Chatbots

Across the seven focus groups that discussed this topic, participants varied in their perceptions of how patients of African ancestry would regard chatbot use in the healthcare setting. Some responded positively, noting that chatbots are “a bit easier expressing and asking any questions, rather than asking someone,” and “an efficient way of communicating.” Others speculated that some patients of African ancestry may question or distrust chatbot accuracy since “pre-selected” information may not address questions in the same way as “asking a question of a human” would.

Relatedly, participants noted that some may prefer personal interactions rather than conversing with a chatbot. As one participant stated, “I’m thinking of people in my network. Something as important as this, they may view this as impersonal. And all of it would have to be repeated anyway when they talk to the doctor. If they want to have a more intimate kind of relationship.” Some participants asserted that patients of African ancestry would accept and feel comfortable using a chatbot, acknowledging variation in people’s preferences for receiving information. One participant commented, “People receive messages in different ways. Some people… you have to talk to them… Some people like me, I’d rather you not ever call me.”

3.2.5 | Individual-Level Barriers to Using Chatbots in the Healthcare Setting

Eight focus groups discussed potential barriers to using chatbots in the healthcare setting, and participants identified individual-level limitations potentially impeding use. Technology barriers were most prominent: some individuals “don’t work with… technology on a regular basis” and may not be “as computer savvy,” thus, having “someone [who] can help them use [Gia]” might be necessary. Challenges with reading chatbot content may arise in individuals who “can’t read still” or would “need larger print” due to older age. Conversely, others expressed that most individuals can access Gia from an Internet hyperlink sent to their phone: “Who actually reads the pamphlets and stuff anymore?… Everybody gets the Internet. It’s on your phone.” Privacy concerns about using chatbots in the clinic also emerged. One participant stated: “maybe you would feel uncomfortable when someone sees” what one is looking at because “maybe you don’t want people to know you want to donate a kidney.” Others did not recognize barriers to using chatbots. For example, “it would be a good resource as just a thing in the lobby, before your appointment to give information” and “no real barriers because you’re not really giving any health information about yourself.”

4 | Discussion

Clinical chatbots are an established patient education modality, including in chronic kidney disease [35]. Our study assessed the attitudes of individuals of African ancestry about using our chatbot for *APOL1* genetic testing in LKD evaluation and using chatbots in the healthcare setting, in general. Participants supported using our chatbot during LKD candidate evaluation to obtain basic information and address questions about *APOL1* genetic testing before meeting their transplant nephrologist.

APOL1 genetic testing raises many ethical issues including informed consent, health disparities, and potential discrimination [36, 37]. Regarding informed consent, our findings highlight the opportunity for transplant teams to administer our *APOL1* chatbot to facilitate culturally competent counseling about *APOL1* genetic testing and living donation. The chatbot is intended to provide foundational information about *APOL1* genetic testing so that the LKD candidate can be empowered to engage in an in-depth discussion with their nephrologist. In doing so, the chatbot may also help save the nephrologist time to focus on the interpersonal dynamics involved in counseling LKD candidates. The transplant nephrologist is better suited than the chatbot to sensitively address the ethical implications of *APOL1* genetic testing on donation.

TABLE 2 | Illustrative, representative quotations about the Gia *APOL1* chatbot and using clinical chatbots by major theme and subtheme.

Themes Subthemes	Illustrative quotations
Support for LKD candidates using the *APOL1* chatbot before the nephrologist clinic visit	
	I think it'll stimulate you if you do have questions with doin' the chat… You'll have those questions for your doctor, when you finish with the chat. (FG-NU4)
	I think it's a great idea to have this because it also gives you a talking point with your doctor. This could be the time you talk to the nephrologist about some of the things you've learned in the chatbot. So I think it would be a good idea to have it, make it available before you go have your visit with the nephrologist. (FG-GU6)
	I just also think that you know, as all of us, we went through multiple visits there, and for each visit, it was like you knew what you were there for, but you weren't sure maybe what was going to occur. And it's almost a nice thing to have, to send out to people, who are in the process of going through donation. …So here's what to expect, and you have Gia take you through so that when people get there for their appointment, they kind of know what's going on. (FG-GU6)
	I think it would be a good resource as just a thing in the lobby, before your appointment to give information if people are interested in it that they can walk up to it, listen to it, watch it while they're waiting for their appointment. (FG-GU6)
Interest in undergoing *APOL1* testing after using Gia	
	Yes, I think I definitely would. I think its, you know, just very good information for somebody considering donating. You know, especially as an African American, you would want to know all the risks involved, going through the entire process. And I think this is something that's very important, going through with it. (FG-NU3)
	I would definitely get [the *APOL1* test] after doing the chat, because it gave me explanation… the chat was helpful and allowed me to make the decision that, yes, I would like to get the test. (FG-NU4)
	Gia was very helpful and knowledgeable about the test, and the statistics that you gave along with background, that would definitely seal the deal for me to move forward and do the test, so yes. Definitely a yes for me. (FG-NU4)
	I would, Yeah, I would. Yes. I'd be like, thank you Gia. Oh my gosh. I'm going to do it. Where do I sign up? [laughs] (FG-GU9)
	I agree that I think I would want to do it, but before doing it I would want to get some more information. But I probably would just so I have as much information as I can, and make an informed decision about whether or not this is something I want to do. Because it's possible if I have the two variants I might decide not to do it thinking about my risk as I got older with health. I think I would want to know to make an informed decision. (FG-GU6)
Influence of *APOL1* genetic testing costs on willingness to get tested	
	The fact that it is being done free to the donor candidates, I would completely and voluntarily go for it since I've gotten all the information and for me, I feel that I should go for it. Yeah, so for me, I would do it. (FG-NU2)
	I almost feel like anyone who is… Anyone that is loving enough, and encouraging enough to do donation. You would almost have to… You would expect that it would be free. It's one of those things where, you've got to consider all the risks. I mean, there are things that, when I talked to my donor, that they were informed of the risk for other things. Now that this is something new, that … would be another risk. I think the option of it getting free has got to bring some ease to a donor, them knowing, "Okay, I can get this tested out before I make that final decision." I like the fact that it's definitely free. (FG-GU10)
	So I'm not sure that the fact that it's free will gear me one way or the other. If I really want to do it, to be honest with you, I'm going to try to do it if I have to pay, try to do what I can to do it, to pay for it. So I'm not sure that that free is going to sway me one way or the other… (FG-GU9)
Patients of African ancestry hold varying preferences about using healthcare chatbots	
Positive attitudes	I think they would take it positively because it is easy to understand, and the fact that Gia is giving very critical information that is easy to understand, and it's also so engaging. (FG-NU2)
	I agree, because the use of our chat bot is a bit easier expressing and asking any questions, rather than asking someone. So, yeah, it's friendly and comfortable… (FG-NU4)

(Continues)

TABLE 2 | (Continued)

Themes Subthemes	Illustrative quotations
Negative attitudes	I'm thinking of people in my network. Something as important as this, they may view this as impersonal. And all of it would have to be repeated anyway when they talk to the doctor. If they want to have a more intimate kind of relationship. (FG-GU7)
	I think there will probably, there's probably some hesitancy, just around, like, is this information accurate… when you have a bot, there's always a little bit of distrust around is this information truly giving me, you know, sort of providing me, understanding, I guess, my questions or understanding what it is that I'm looking for the same way that if I'm asking a question of a human? And if so, sort of having limited information almost, again, makes me then distrust that this is the right tool for me. (FG-GU6)
Individual-level barriers to using chatbots in the healthcare setting	
Technology barriers	… let's say somebody like my brother who I donated to, … somebody would have to help him. He's a little bit older than me. However, he lives in a rural environment. He doesn't have Internet in his home other than using a cell phone or something. So it just depends. It depends on that person's experience. (FG-GU8)
	I think it may be good that you have them do it there in case someone's not as computer savvy so someone can help them use it. (FG-GU10)
Literacy challenges	But you still have some persons that … can't read still. (FG-NU3)
	I just think the age of the people that are going to take this are going to need larger print. (FG-NU5)

We previously reported that participants perceived our *APOL1* chatbot as "informative," "neutral," and culturally sensitive—all essential for increasing clinical uptake [18]. Nearly all participants desired undergoing *APOL1* testing after having tried Gia. While most participants desired undergoing *APOL1* testing regardless of financial costs, some would undergo testing only if it were free. Other research similarly found that most individuals of African ancestry with a family history of kidney disease, who read a paragraph about *APOL1*, would want *APOL1* testing, suggesting that transparent information through Gia may enable patients to effectively consider *APOL1* genetic testing [38]. Moreover, Black/African American patients are generally receptive to e-health interventions [39].

As with any technological interface, end-users may encounter barriers. Our participants recognized that patients may encounter challenges with accessibility, privacy, and lack of human interaction, all previously considered [40]. Accordingly, wide adoption of the *APOL1* Gia chatbot into transplant care would require enabling LKD's access to technology, providing assurances of privacy measures including flow diagrams mapping data usage, storage, and sharing, and supporting those with limited health literacy.

This study has strengths. Our multi-site study in geographically-distinct regions supports transferability of findings. Our study provided novel insights into attitudes about chatbot use among individuals of African ancestry. Our recruitment of individuals of African ancestry, traditionally difficult to recruit due to mistrust in the healthcare system, increases the transferability of our study findings across diverse populations. By providing information about genetics and *APOL1* at the outset, our focus groups facilitated participants' informed feedback.

Study limitations include participation primarily among living donors, which was intentional because our focus is on intervening at the donor level. Views expressed by individuals recruited in urban areas may not be transferrable to individuals in rural areas. Although more females participated in focus groups than males, the proportion of female LKDs mirrored national rates. Most participants had private health insurance, were college-educated, and had adequate health literacy, which may have affected responses. In our current trial, potential living donors are using the Gia chatbot as part of the donor evaluation process, which provides an opportunity to assess how donors of different health literacy and digital literacy levels fare with the chatbot in a real-world setting. Our participants' average age was greater than that of LKDs nationally. The focus groups did not discuss that donors testing positive may be denied the opportunity to donate; it is unknown whether this information would have affected respondents' interest in undergoing *APOL1* testing. Participants might not have understood genetics information.

Our findings suggest that individuals of African ancestry were highly receptive to using the *APOL1* chatbot in LKD evaluation. Gia may support the transplant team in counseling LKD candidates. Ongoing research will assess *APOL1* chatbot use in fostering informed decision-making about donation to scale-up *APOL1* genetic testing in LKD candidate clinical evaluation.

Author Contributions

Research idea and study design: Elisa J. Gordon, Catherine Wicklund, and Debra Duquette. Data acquisition: Jessica Gacki-Smith, Rochell Yacat, and Elisa J. Gordon. Data analysis/interpretation: Elisa J. Gordon, Jessica Gacki-Smith, and Rochell Yacat. Drafting the manuscript: Elisa J. Gordon, Jessica Gacki-Smith, and James L. Rogers. Statistical analysis: Jessica Gacki-Smith. Supervision or mentorship: Elisa J. Gordon. Each author contributed important intellectual content during manuscript drafting or revision and agrees to be personally accountable for the individual's own contributions and to ensure that questions pertaining to the accuracy or integrity of any portion of the work, even one in which the author was not directly involved, are appropriately investigated and resolved, including with documentation in the literature if appropriate.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Research data are not shared.

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