



RESEARCH ARTICLE

The effectiveness of psychiatric genetic counseling training: An analysis of 13 international workshops

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Abstract

Studies have consistently shown that psychiatric genetic counseling (pGC) helps people with psychiatric conditions by increasing empowerment and self-efficacy, and addressing emotions like guilt. Yet, it is not routinely provided. Genetic counselors and trainees express low confidence in their ability to provide meaningful pGC, especially in the absence of adequate training. Therefore, to address this gap a “Psychiatric Genetic Counseling for Genetic Counselors” (PG4GC) workshop was developed and delivered to 13 groups of participants (primarily qualified genetic counselors and trainees) between 2015 and 2023 (10 workshops were delivered in-person, and three virtually). Participants completed quantitative questionnaires both before and after completing the workshop to assess their comfort, knowledge, behavior, and feeling of being equipped to provide pGC. In total, 232 individuals completed the pre-workshop questionnaire and 154 completed the post-workshop questionnaire. Participants felt more comfortable, knowledgeable, and equipped to provide pGC, and reported being more likely to address psychiatric concerns after the workshop, regardless of whether they were trainees or practicing professionals and whether they completed the workshop in-person or virtually. This study suggests that the PG4GC workshop is an effective educational tool in pGC training that may aid in broader implementation of the service.

KEYWORDS

education, genetic counseling, mental health, psychiatric genetic counseling, training

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1 | INTRODUCTION

Since the development of psychiatric genetic counseling (pGC) in the early 2000s, literature has consistently highlighted its correlation to

positive outcomes for people with psychiatric conditions such as schizophrenia, bipolar, eating disorders, depression, and anxiety (Austin, 2020). By helping to establish an understanding of the genetic and environmental contributions to psychiatric conditions and associated risk-reducing

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Gc Workshop Pre Survey

Please complete the survey below prior to our workshop.

Thank you!

TPGG team

1) Please enter the city where you are attending this workshop: _____

2) Please Enter Today's Date: _____

3) 1. How comfortable do you feel to ask patients about their family history of psychiatric illness?
 Very Uncomfortable
 Uncomfortable
 Neutral
 Comfortable
 Very Comfortable

4) 2. How often do you ask patients about their family history of psychiatric disorders?
 Never
 Rarely
 Occasionally
 Sometimes
 Always

5) 3. How comfortable do you feel to ask patients about their personal history of psychiatric illness?
 Very Uncomfortable
 Uncomfortable
 Neutral
 Comfortable
 Very Comfortable

6) 4. How often do you ask your patient about their personal history of psychiatric illness?
 Never
 Rarely
 Occasionally
 Sometimes
 Always

7) 5. How comfortable do you feel to discuss the etiology of psychiatric disorders with patients/families?
 Very Uncomfortable
 Uncomfortable
 Neutral
 Comfortable
 Very Comfortable

8) 6. How comfortable do you feel to discuss risks for other family members to develop psychiatric disorders?
 Very Uncomfortable
 Uncomfortable
 Neutral
 Comfortable
 Very Comfortable

9) 7. I feel that my knowledge about etiology of psychiatric disorders is...
 Very Poor
 Poor
 Good
 Very Good
 Excellent

FIGURE 1 Pre- and post-workshop questionnaires. Green highlighting indicates knowledge questions, purple represents comfort questions, and yellow indicates behavior/feeling overall equipped questions.

strategies, and by uncovering and addressing associated emotions, pGC has been shown to provide empowerment, reduced guilt, greater self-efficacy, and acceptance of illness for patients and their families (Austin, 2020; Semaka & Austin, 2019). Even in the absence of genetic testing, people with psychiatric conditions are interested in pursuing pGC and believe that meeting with a genetic counselor would be beneficial (Lysus, 2007). Despite its proven effectiveness and interest among the target group, certain barriers challenge pGC accessibility, considerably limiting its services (Moldovan et al., 2019).

One well-described barrier to the practice and implementation of pGC is genetic counselors' discomfort with providing the service. This is partly due to genetic counselors having low confidence to provide efficient and effective service (Booke et al., 2020; Dillion et al., 2022). As highlighted by newly graduated genetic counselors and trainees, this lack of confidence may be partly attributed to insufficient training of psychiatric conditions within the graduate curriculum (Low et al., 2018). Additionally, genetic counselors have expressed discomfort in addressing uncertainty with psychiatric conditions given the absence of genetic testing. Consequently, both genetic counselors and trainees have expressed a need for more guidance in addressing these concerns (Booke et al., 2020).

Given these barriers, a workshop—Psychiatric Genetic Counseling for Genetic Counselors (PG4GC)—was designed (by author JA), with the purpose of increasing the confidence and the competence of attendees to provide psychiatric genetic counseling for people with psychiatric conditions and their families. A previous study qualitatively explored perceptions of the outcomes of participating in the workshop (Dillon et al., 2022), but the effects of the workshop have not previously been quantitatively explored. In this study, we sought to address this gap by examining responses provided by participants to surveys that were administered before and after the workshop. Specifically, we sought to examine the effect of attending the workshop on participants' comfort, knowledge, and behavior/preparedness to address psychiatric conditions.

2 | METHODS

2.1 | Overview of the PG4GC workshop

The workshop was developed according to the fundamentals of adult learning theory, emphasizing (a) active engagement; (b) that content is

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10) 8. I feel that my knowledge about risks for other family members to develop psychiatric disorders is...

Very Poor
 Poor
 Good
 Very Good
 Excellent

11) 9. I feel that my knowledge of terminology related to psychiatric disorders (eg. knowing what positive and negative symptoms are, understanding general features of schizoaffective disorders, difference between bipolar 1 and 2) is...

Very Poor
 Poor
 Good
 Very Good
 Excellent

12) 10. I feel that my knowledge related to genetics (eg. knowing what mutation, CNV, SNP, GWAS are) is...

Very Poor
 Poor
 Good
 Very Good
 Excellent

13) 11. I feel well equipped to provide meaningful genetic counseling for people with psychiatric disorders and their families.

Strongly Disagree
 Disagree
 Neutral
 Agree
 Strongly Agree

14) 12. What gaps in your knowledge you would like to address to feel better able to provide genetic counseling for people with psychiatric disorders?

15) 13. I am a:

Genetic counselor
 Psychiatrist
 Psychologist
 Genetic counseling student
 Non-genetic counseling student
 Other

Please also do Part 2: Complete the Mental Illness Implicit Association Test (IAT) (takes about 5 minutes). Link and instructions provided in email sent to you by organizer.

FIGURE 1 (Continued)

relevant, meaningful, and useful; and (c) that content utilizes reflective strategies to connect experience and previous knowledge (Palis & Quiros, 2014). All workshops involved fundamental concepts: psychiatric genetics, psychiatric diagnosis, stigma of psychiatric conditions, assessing and communicating risk, psychotherapeutic aspects of genetic counseling, and techniques and tools for pGC (Anderson & Austin, 2012; Dillon et al., 2022). The workshop design utilized multiple learning modalities including: interactive small group work, large

group discussions, video, didactic lectures, case discussions, personal reflection work (e.g., Harvard implicit association test about mental illness and stigma), and problem-based learning (Dillon et al., 2022).

PG4GC workshops were held during the years 2015–2023. Due to the COVID-19 pandemic, workshops were offered virtually in 2021–2023—the content and structure of the online version of the workshop was the same, except that the didactic portions were completed asynchronously by participants prior to synchronous zoom-based discussion

Page 1

Gc Workshop Post Survey

Please complete the post workshop survey below.

Thank you!

TPGG team

Please enter the name of the city the workshop is taking place (e.g. New York): _____

Please Enter Today's Date: _____

1. How comfortable do you feel to ask patients about their family history of psychiatric illness?
 Very Uncomfortable
 Uncomfortable
 Neutral
 Comfortable
 Very Comfortable

2. How often do you ask your patients about their family history of psychiatric disorders?
 Never
 Rarely
 Occasionally
 Sometimes
 Always

3. How comfortable do you feel to ask patients about their personal history of psychiatric illness?
 Very Uncomfortable
 Uncomfortable
 Neutral
 Comfortable
 Very Comfortable

4. How often do you ask your patient about their personal history of psychiatric illness?
 Never
 Rarely
 Occasionally
 Sometimes
 Always

5. How comfortable do you feel to discuss the etiology of psychiatric disorders with patients/families?
 Very Uncomfortable
 Uncomfortable
 Neutral
 Comfortable
 Very Comfortable

6. How comfortable do you feel to discuss risks for other family members to develop psychiatric disorders?
 Very Uncomfortable
 Uncomfortable
 Neutral
 Comfortable
 Very Comfortable

7. I feel that my knowledge about etiology of psychiatric disorders is...
 Very Poor
 Poor
 Good
 Very Good
 Excellent

FIGURE 1 (Continued)

sessions instead of these components being delivered in-person. Workshops were open to attendees from a variety of backgrounds, such as genetic counselors, psychiatrists, psychologists, genetic counseling trainees, and other trainees. In-person workshops were held in

Bournemouth, UK, between 2015 and 2019 and were open to participants from around the world on an application basis. Other workshops were arranged (online or in-person) on request by particular groups (Dillon et al., 2022). All workshops involved two facilitators and

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8. I feel that my knowledge about risks for other family members to develop psychiatric disorders is...

Very Poor
 Poor
 Good
 Very Good
 Excellent

9. I feel that my knowledge of terminology related to psychiatric disorders (eg. knowing what positive and negative symptoms are, understanding general features of schizoaffective disorder, difference between bipolar 1 and 2) is...

Very Poor
 Poor
 Good
 Very Good
 Excellent

10. I feel that my knowledge of terminology related to genetics (eg. knowing what mutation, CNV, SNP, GWAS are) is...

Very Poor
 Poor
 Good
 Very Good
 Excellent

11. I feel well equipped to provide meaningful genetic counseling for people with psychiatric disorders and their families.

Strongly Disagree
 Disagree
 Neutral
 Agree
 Strongly Agree

13. I am a:

Genetic counselor
 Psychiatrist
 Psychologist
 Genetic counseling student
 Non-genetic counseling student
 Other

Which element of the workshop was the LEAST impactful or useful for you? _____

Which element of the workshop was the MOST impactful for you? _____

What feedback would you give us that you think would help us to make the workshop better if we run it again? _____

Would you recommend the workshop to others?

Yes
 No
 Maybe

Why? _____

How did you find out about the workshop? _____

Thank you for taking the time to complete this post workshop survey!

FIGURE 1 (Continued)

TABLE 1 Participant demographics including occupation and workshop details including year the workshop was offered, location, modality, and how many participants completed questionnaires. Courses that were offered virtually are specified.

Characteristic	Pre workshop	Post workshop
Occupation	<i>n</i> (%)	<i>n</i> (%)
Genetic Counselor	<i>n</i> = 103 (44.4%)	<i>n</i> = 78 (50.6%)
Genetic Counseling Student	<i>n</i> = 99 (42.7%)	<i>n</i> = 61 (39.6%)
Non-genetic Counseling Student	<i>n</i> = 7 (3.0%)	<i>n</i> = 3 (1.9%)
Psychologist	<i>n</i> = 4 (1.7%)	<i>n</i> = 1 (0.6%)
Psychiatrist	<i>n</i> = 8 (3.4%)	<i>n</i> = 7 (4.5%)
Other	<i>n</i> = 11 (4.7%)	<i>n</i> = 4 (2.6%)
Course		
Bournemouth 2015	<i>n</i> = 32 (13.8%)	<i>n</i> = 0 (0%)
Bournemouth 2016	<i>n</i> = 16 (6.9%)	<i>n</i> = 13 (8.4%)
San Francisco 2016	<i>n</i> = 0 (0%)	<i>n</i> = 25 (16.2%)
Bournemouth 2017	<i>n</i> = 19 (8.2%)	<i>n</i> = 25 (16.2%)
Bournemouth 2018	<i>n</i> = 14 (6.0%)	<i>n</i> = 0 (0%)
Bournemouth 2019	<i>n</i> = 11 (4.7%)	<i>n</i> = 7 (4.5%)
San Francisco 2019	<i>n</i> = 33 (14.2%)	<i>n</i> = 21 (13.6%)
Cape Town 2019	<i>n</i> = 22 (9.5%)	<i>n</i> = 11 (7.1%)
Bournemouth 2020	<i>n</i> = 34 (14.6%)	<i>n</i> = 14 (9.0%)
Washington DC 2020	<i>n</i> = 8 (3.4%)	<i>n</i> = 0 (0%)
London Virtual 2021 ^a	<i>n</i> = 18 (7.8%)	<i>n</i> = 17 (11.0%)
London Virtual 2023 ^b	<i>n</i> = 14 (3.4%)	<i>n</i> = 15 (9.7%)
Washington DC Virtual 2023 ^c	<i>n</i> = 11 (4.3%)	<i>n</i> = 6 (3.9%)
Total participants	<i>n</i> = 232 (100%)	<i>n</i> = 154 (100%)

Note: Total numbers of attendees for the in-person workshops were not available, but most were capped at around 30 attendees.

^a20 people attended this workshop in total.

^b18 people attended this workshop in total.

^c11 people attended this workshop in total.

participation numbers for each workshop were typically capped at around 30 to allow appropriate facilitation of small groups.

2.2 | Questionnaire

Participants were asked to complete anonymous questionnaires both pre- and post-workshop (Figure 1) which asked for basic demographic information (i.e., occupational title: genetic counselor, genetic counseling trainee, etc.), and assessed their perceived: (1) comfort with providing pGC (pre-workshop questions: 3, 5, 7, 8, and post-workshop questions: 1, 3, 5, 6), (2) knowledge relating to pGC issues (pre-workshop questions: 9, 10, 11, 12, 13, and post-workshop questions: 7, 8, 9, 10, 11), and (3) behavior regarding and preparedness for pGC (pre-workshop questions: 4, 6, 13, and post-workshop questions: 2, 4, 11). Questions were answered by selecting a response on a five-point Likert scale. All questionnaires were completed online, aside from participants in the first workshop who completed their pre-workshop questionnaire using pen and paper.

2.3 | Data analysis

We used a quantitative approach using data from all individuals who completed at least one questionnaire associated with the PG4GC workshop between 2015 and 2023. Responses to questions about comfort, knowledge, and behavior/preparedness to provide pGC were coded numerically (one being the least comfortable/knowledgeable, and five being the most). For each individual, scores for comfort, knowledge, and behavior/preparedness were computed by taking the mean across all of the completed questions relating to each category. All data were presented and analyzed in aggregate. To compare gains across groups, we computed a Gaussian linear model where the mean scores were modeled as the outcome and pre- versus post- course status was modeled as the predictor, adjusting for student status and virtual status as covariates. To assess whether student status or virtual status affected the change between pre- and post-course differently, we also modeled the interaction between student status or virtual status and pre- and post-course status. We applied an FDR correction to account for the 12 statistical tests that we ran (four comparisons across three categories), and report all FDR *p*-values <0.05 as significant.

Additionally, descriptive deductive content analysis of the free-form text that participants included in their pre- and post-workshop questionnaires was performed to assess the topics that participants identified as key knowledge gaps (pre-workshop), and which components were most and least helpful components of the workshop (post-workshop).

This study was exempt from ethics review given that anonymous data were collected essentially as quality assurance around the delivery of an educational intervention. Participants were invited to participate on a voluntary basis and they had the option not to take part or opt out at any stage.

3 | RESULTS

In total, 13 workshops were delivered between 2015 and 2023: three (23%) were delivered online, and ten (77%) were delivered in person. Two hundred thirty-two individuals completed pre-workshop questionnaire, and 154 completed the post-workshop questionnaire. Workshop participants were based in 15 different countries (Table 1, Figure 2), and the largest group (*n* = 103, 44.4%) was made up of genetic counselors or genetic counseling trainees (Table 1). Overall, 189 participants (81.5% of the total) attended in-person workshops and 43 participants (18.5%) attended virtually. Table 1 describes the characteristics of participants who completed pre- and post-workshop questionnaires. Although exact numbers of participants were not recorded, most in-person workshops were capped at around 30 participants, with the number of participants in the virtual sessions being driven by the number of members in the team that had requested the training (Table 1). Assuming these parameters, it is estimated that about 2/3 of workshop attendees (66%) completed pre-workshop questionnaires, and just under half (45%) completed post-workshop questionnaires.

Total scores for comfort, knowledge, and behavior/preparedness were significantly increased in the post-workshop questionnaire

compared to the pre-workshop questionnaire (p -values: comfort = 4.44×10^{-19} , knowledge = 7.24×10^{-48} , behavior/preparedness = 2.16×10^{-35} ; Figures 3-5, Table 2). Effect sizes were large, with coefficients ranging from 0.80 to 0.95, indicating almost a full unit increase associated with taking the course (with units representing a score between 1 and 5, where 1 is “Very Uncomfortable” with the topic and 5 is “Very Comfortable” in the area). The mean scores for each category and the mean increase across each category (represented by the model coefficients), indicate that the majority of individuals were “Neutral” (score of ~ 3) in each category prior to taking the course, but moved to “Comfortable” (score of ~ 4) after taking the course.

There were no statistically significant differences in the gains made between pre- and post- course scores for comfort, knowledge, or behavior/preparedness outcomes between professionals and trainees or between the different modalities of delivery of the workshop (online vs. in-person).

In the free-form text responses, participants completing the pre-workshop questionnaire most frequently identified risk, etiology, psychiatric symptoms, diagnosis, and treatment as gaps in their knowledge that they would like to address to feel better able to provide genetic counseling for people with psychiatric conditions (Table 3).

In free-form text responses, participants most often rated the problem-based learning to be the most useful component of the workshop. Though much smaller number, some people also rated the problem-based learning to be the least helpful component. Similarly, although the discussion around the psychotherapeutic implications of genetic counseling was most often rated as the least useful component ($n = 8$), 10 people also rated this as the most helpful element (Table 4). Overall, 122 participants (87.2% of those who answered the

question) indicated that they would recommend the PG4GC workshop to others.

4 | DISCUSSION

We found that the PG4GC workshop increased participants' comfort and knowledge with pGC and that it positively influenced participants' feelings of being equipped to provide pGC. Our data corroborate and strengthen the findings of previous qualitative research that demonstrated the PG4GC workshop had an overall positive impact and empowered participants to feel more confident and comfortable offering pGC (Dillon et al., 2022).

The PG4GC workshop had positive outcomes for participants regardless of trainee/practitioner status or whether participation was in-person or online. The lack of difference in outcomes between professionals with various degrees of experience was not surprising given the workshop's design (attempting to “meet learners where they are”). Additionally, given that most practitioners do not have a lot of exposure to providing pGC, in this specific area, trainees and practitioners may have similar levels of knowledge and skills (Moldovan et al., 2019). Seeing similar gains for both in-person and online delivery of the workshop is unsurprising, as it aligns with findings of other educational intervention studies (Benjamin et al., 2008; He et al., 2021; Neuenschwander et al., 2013).

It is interesting to note that although in the pre-workshop questionnaire, the most frequently noted knowledge gap that participants wanted to address was the risk for psychiatric conditions, in the

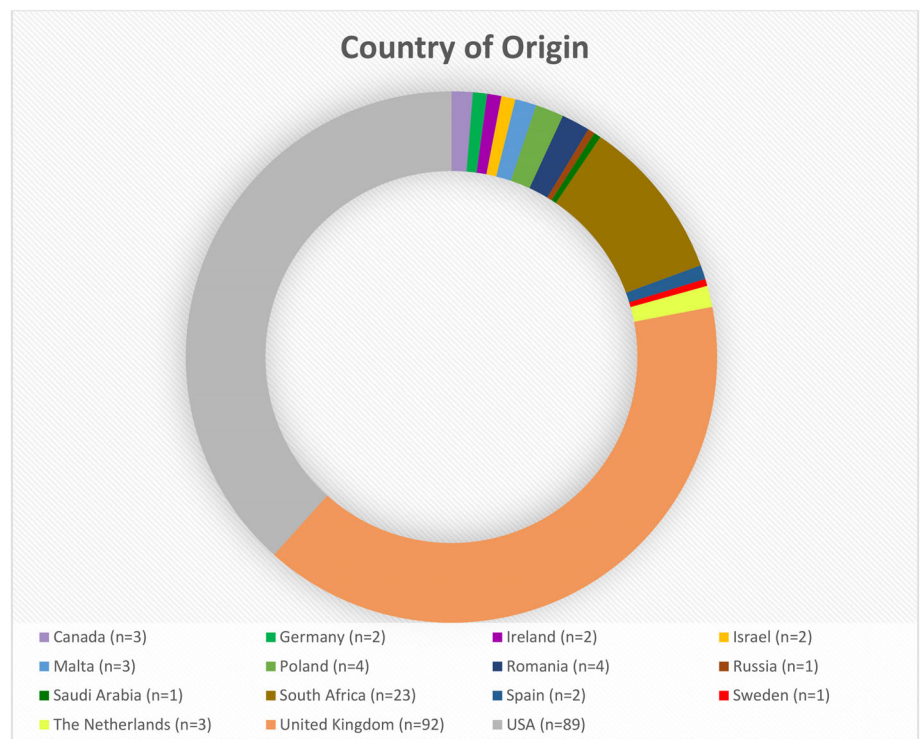


FIGURE 2 Participant country of origin.

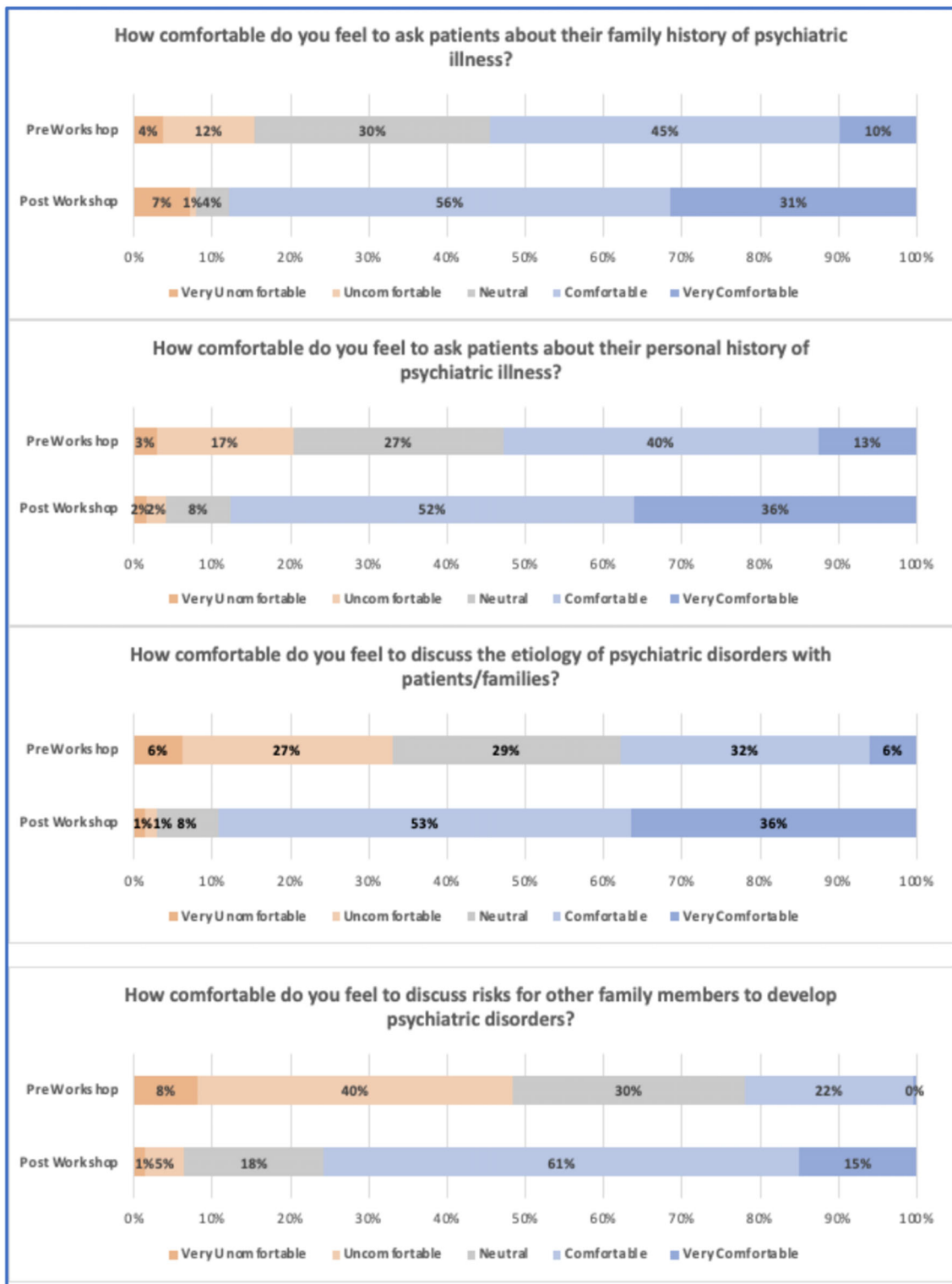


FIGURE 3 Comfort domain pre- and post-questionnaire outcomes.

post-workshop evaluation this was not noted as the most useful component of the workshop. Rather, the problem-based learning was most frequently noted as the most useful component; this aligns with previous studies that demonstrate problem-based learning to be the preferred teaching strategy for clinical concepts as they encourage

critical thinking skills, foster self-directed learning, and integrate knowledge from other learned concepts and experiences (Al-Shaih et al., 2015; Azer et al., 2013). The PBL case used in this workshop can be freely accessed here: <https://bcchr.ca/TPGG/resources/educational-materials>.

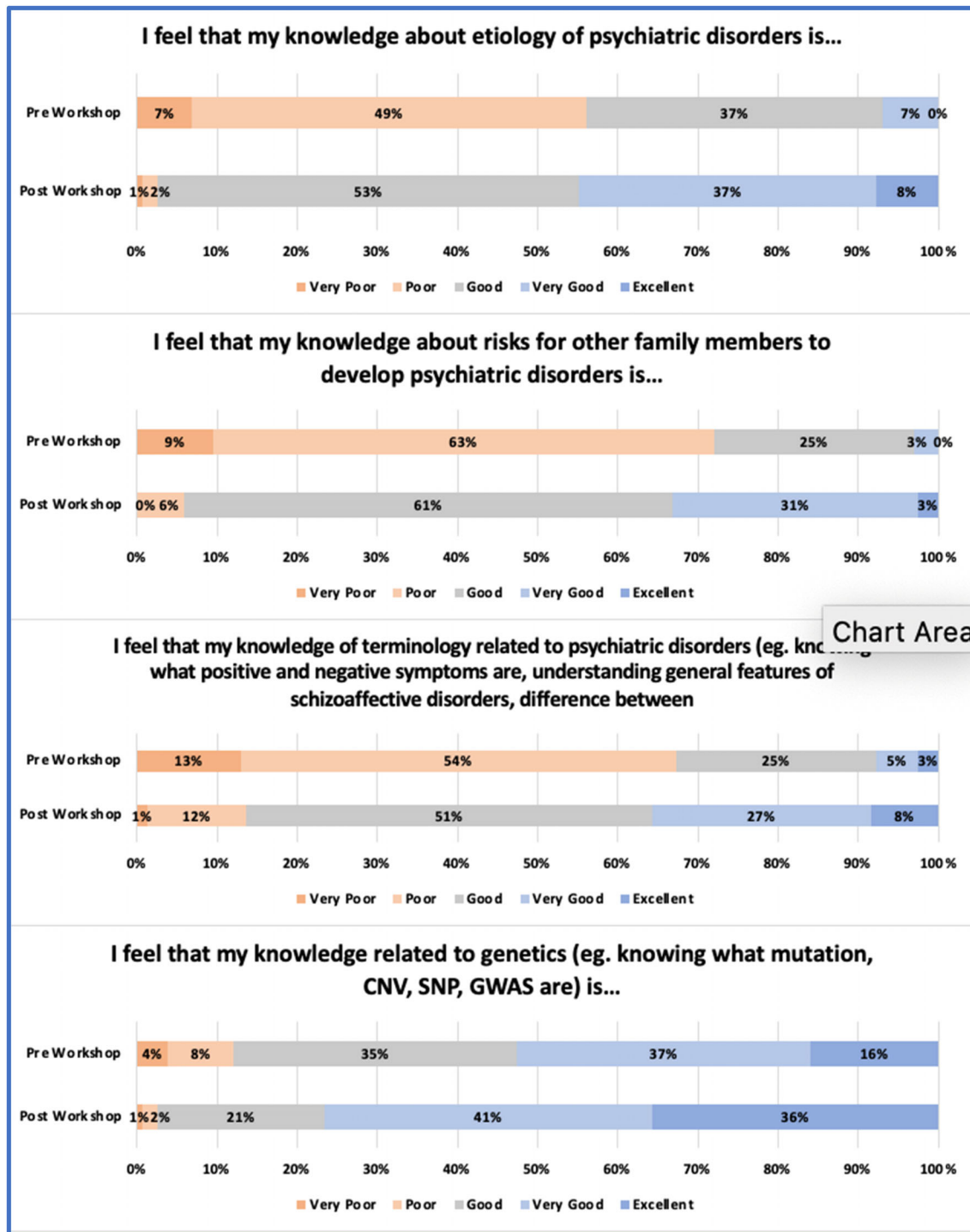


FIGURE 4 Knowledge domain pre- and post-questionnaire outcomes.

Additionally, the mixed views among participants regarding several components of the workshop (e.g., stigma related to psychiatric conditions, psychotherapeutic implications of pGC) are worth noting. It is likely that what participants found most or least useful about the workshop will vary according to their background, previous knowledge, personal preferences, and confidence with various issues. Additionally, given implicit biases and stigma surrounding psychiatric conditions, and that the workshop encouraged participants to reflect on assumptions, biases, and beliefs of what could be considered

sensitive topics, it is possible that feelings of being challenged to consider different opinions influence perceptions of component usefulness (Monaco et al., 2010). This effect has been documented previously in one study that assessed health professional's feedback to implicit bias test results regarding mental illness, participants expressed feeling criticized and questioned the test's validity (Sukhera et al., 2019). Similarly, discussion around the purpose and ethos of genetic counseling can be emotive and can challenge assumptions, sometimes deeply held, about the purpose of genetic counseling. It is

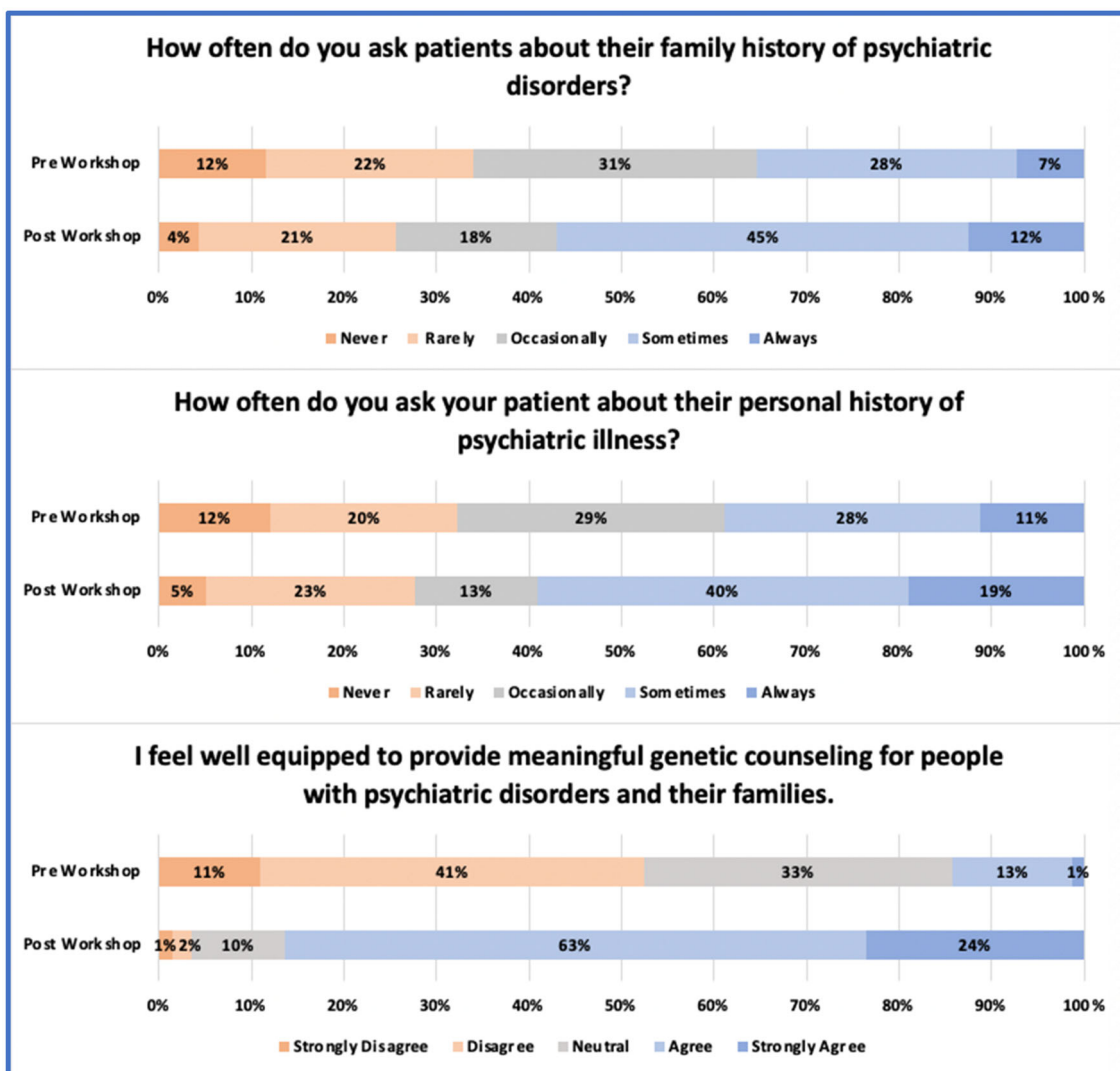


FIGURE 5 Behavior and overall feeling of being equipped pre- and post-questionnaire outcomes.

TABLE 2 summary of mean scores for knowledge, comfort, and confidence for both pre- and post-workshop together with inferential statistics.

Variable	Mean score [95% CI]		Coefficient	SE	p-value	FDR
	Pre	Post				
Knowledge	2.62 [2.55-2.69]	3.54 [3.46-3.62]	0.93	0.06	7.24×10^{-48}	2.17×10^{-47}
Comfort	3.09 [3.00-3.18]	4.04 [3.94-4.14]	0.95	0.07	2.16×10^{-35}	3.24×10^{-35}
Confidence	2.82 [2.71-2.93]	3.65 [3.52-3.78]	0.80	0.08	4.44×10^{-19}	4.44×10^{-19}

worth considering how to best approach challenging topics and ensure the most effective learning environment.

5 | IMPLICATIONS

Studies have demonstrated that pGC provides the opportunity for patients to address common misconceptions about their psychiatric condition and gather valuable information for themselves and family

members such as recurrence, heritability, early signs and symptoms, and risk-mitigating strategies (Austin & Honer, 2007; Hippman et al., 2016; Inglis et al., 2015). After pGC, patients report feeling less distressed, ashamed, or guilty and being empowered to adopt lifestyle behaviors that are known to be helpful when dealing with a psychiatric condition, such as getting better sleep, exercising, and having better nutrition (Semaka & Austin, 2019). Therefore, improvement of the ability for providers to confidently offer effective pGC services is imperative. These data demonstrate that the PG4GC workshop is effective in meeting

TABLE 3 Pre workshop—participants' self-identified gaps in knowledge that they would like to address to feel better able to provide genetic counseling for people with psychiatric conditions.

Knowledge gap	Number of participants identifying the area as a gap (n (%))
Risk	103 (44%)
Etiology	77 (33%)
Psychiatric symptoms/diagnosis/treatment	47 (20%)
Genetic testing for psychiatric conditions	43 (18%)
How to have a meaningful and effective discussion	40 (17%)
Other (keeping on top of literature, referrals, prevention, communication techniques)	34 (15%)
How to take a family history	22 (9%)
Everything	11 (5%)
How to discuss non-judgmentally	8 (3%)
Syndromes	2 (1%)
Pharmacogenomic testing	2 (1%)

Note: These data are drawn from an optional freeform text question. Some participants did not complete this question, and other participants' responses were assigned multiple codes. For this reason, the total number of responses is different from 232. The percentages are calculated based on the total number of participants who completed pre-workshop surveys, so the total does not add up to 100%.

TABLE 4 Post workshop—participants' perceptions on the most and least helpful components of the PG4GC workshop.

Component of workshop	Least useful (n (%))	Most useful (n (%))
Content components		
Problem-based learning case	5 (3%)	32 (21%)
Genetics didactic	2 (1%)	4 (3%)
Psychiatric diagnosis didactic	4 (3%)	3 (2%)
Family history discussion	1 (<1%)	2 (1%)
Risk discussion	1 (<1%)	10 (6%)
How to start a pGC clinic discussion	5 (3%)	2 (1%)
Discussions around the purpose and ethos of genetic counseling (psychotherapeutic implications)	8 (5%)	10 (6%)
Stigma video and discussion	7 (5%)	13 (8%)
Jar model	1 (<1%)	7 (5%)
Process/structural components		
Opening/agenda setting	3 (2%)	1 (<1%)
Small group work	2 (1%)	7 (5%)
Large group discussions	4 (3%)	4 (3%)
Didactic sessions in general	1 (<1%)	7 (5%)
Wrap up	1 (<1%)	1 (<1%)
Other (e.g., presenters' energy, class interactions, feeling empowered overall)	0 (0%)	19 (12%)

these objectives. Integrating workshops such as the PG4GC into genetic counseling training curricula, and providing opportunities for established practitioners to participate for continuing education credits can provide opportunities for development or improvement of skillsets which will enable the workforce to provide pGC more broadly.

6 | LIMITATIONS

The response rate could not be definitively determined—most in-person workshops were capped at around 30 attendees, and the virtual workshops were driven by number of team members in the group that had requested the course (Table 1). It is possible that those who chose to complete both the workshop and the questionnaires were self-selected for particular types of perspective or experience. Due to the anonymous nature of the questionnaires, we were unable to track changes in score from pre- to post-workshop at the level of individual participants. Further, this study collected no data on learning retention outcomes over time, and whether participants' behavior and practice changed post-workshop.

7 | CONCLUSION

The PG4GC workshop is a successful and effective training method for increasing participant's comfort, knowledge, and behavior/preparedness to provide pGC to people with psychiatric conditions and their families. Opportunities to integrate workshops such as PG4GC into genetic counseling training curricula, and continuing education for established practitioners should be explored.

AUTHOR CONTRIBUTIONS

Tiera Mack: Data analysis, writing of original draft. **Rolan Batallones:** Data curation, review, and editing. **Emily Morris:** Investigation, review, and editing. **Angela Inglis:** Investigation, review, and editing. **Ramona Moldovan:** Investigation, review, and editing. **Kevin McGhee:** Conceptualization, investigation, funding, review, and editing. **Kip D. Zimmerman:** Data analysis, review, and editing. **Jehannine Austin:** Conceptualization, study design, data curation, data analysis, supervision, review, and editing.

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Fusion Investment Fund and Higher Education Innovation Fund (HEIF). Ramona Moldovan was supported by the NIHR Manchester Biomedical Research Centre (NIHR203308) and LifeArc Pathfinder award (PATHFINDER004). The views expressed are those of the author and not necessarily those of the NIHR or the Department of Health and Social Care.

CONFLICT OF INTEREST STATEMENT

The authors have declared no conflicts of interest for this article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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