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Research Article

Results from the Delivery of a Community Health Worker Training to Advance Competencies in Cancer Genomics

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Short Title: Delivery of Community Health Worker Training in Cancer Genomics

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Abstract

Introduction: Less than half of eligible Black women are assessed for genetic risk and only 28% engage in recommended HBOC risk-reducing interventions. CHWs are trusted members of the community that work as a liaison between health systems and the community to improve access to services and support cancer prevention efforts, though they are an overlooked resource to support genetic risk assessment. To address the need and training gaps for CHWs we developed and assessed an online training program to build CHW's competencies in cancer genomics and use of health information technologies to navigate high-risk individuals to appropriate genetic services.

Methods: The curriculum and modules were developed through engaging a panel of experts in a three-round Delphi process. The process led to the creation of 10 modules for the training. Recruitment focused on CHWs who worked in clinical settings or groups providing outreach or health services to Black women. We assessed: changes in knowledge and attitudes about HBOC and genomics, as well as the perceptions about the quality and implementation of the training.

Results: 46 individuals expressed interest in the training after recruitment. 38 individuals were eligible for the training and 26 completed the course. We found improvements in knowledge and genomics competencies immediately post-course, but the majority of these improvements were not sustained at three-months follow up. The training was highly rated for its relevance to CHW work and overall delivery. Top rated sessions included Hereditary Breast and Ovarian Cancer and Family History and Family History Collection. On average, participants reported discussing HBOC with 17 individuals at three-months follow-up.

Conculsion: Championing a diverse cancer and genomics workforce can help address the goals of the National Cancer Plan to improve early detection and health equity. Through this training, CHWs gained critical cancer and genomics knowledge that was then applied to their primary roles.

Introduction

In the National Cancer Plan, the National Cancer Institute outlined eight goals to support prevention of cancer, reduce deaths from cancer, and ensure high quality of life among those living with cancer.[1] In particular, the plan focuses on early detection, with the goal of identifying and treating cancer at early stages to reduce morbidity and mortality. Identification of individuals with hereditary breast and ovarian cancer (HBOC) is aligned with this goal, as individuals with HBOC syndrome have a 10-times greater lifetime risk of developing breast or ovarian cancer than the general population.[2, 3] Once an individual is identified as at risk for HBOC because of deleterious BRCA1 or BRCA2 mutation, they can be provided with more intensive prevention measures (e.g., breast MRI, screening initiation at a younger age), greatly reducing cancer incidence and mortality.[4-7]

Further, there are important considerations to ensuring early detection among racial and ethnic minorities. The prevalence of a pathogenic BRCA1 or mutation has been reported up to 10.2% among Black women compared to 5.7% among White women, and BRCA2 mutation occurring at a rate of 6.9% compared to 5.2% in White women.[8] Unfortunately, less than half of eligible Black women are assessed for genetic risk and only 28% engage in recommended HBOC risk-reducing interventions, including less than 10% of individuals that complete genetic counseling and testing.[8-15] Additionally, Black women are 45% less likely to use digital tools and online risk assessments that improve early detection. [16, 17] A multitude of factors contribute to the underutilization of genetic testing services among Black women, including lower patient awareness and attitudes toward testing, lower provider referrals, and lower access to genetic testing services.[18] More equitable access to and use of genetic counseling and testing could help address racial disparities through earlier identification and intervention among high-risk individuals. Addressing these persistent barriers and inequities related to the identification, referral, and navigation of individuals through genetic services require innovative solutions, including the engagement of community health workers (CHWs).

CHWs are trusted members of their community that work as a liaison between health systems and the community to improve access to services, quality, and cultural competence of service delivery.[19] CHWs are often engaged in the delivery of clinically focused and research focused interventions to improve the uptake of cancer screening,[20-22] cardiovascular disease prevention,[23, 24] and support recruitment and retention in clinical and research efforts among racial and ethnic minorities.[25, 26] Benefits of including CHWs as members of research teams and health service delivery include: increased acceptability of the intervention and ensuring culturally relevant models of delivery,[27-29] access to broader social networks for participant recruitment,[30, 31] maximizing participant benefit from the intervention,[32-34] and CHWs becoming a lasting community resource about the specific topic.[29, 35, 36] CHWs do not have a national credentialing system and thus rely on state-level organizations and outsides means for training and development.[37]

As trusted members of communities, CHWs are a well-positioned but overlooked workforce in genomics, and therefore lack the necessary competencies needed to identify high-risk women and navigate them to appropriate services.[38, 39] Engaging CHWs in early detection and genomic competency building initiatives for individuals at high risk for cancer meets a goal of the National Cancer Plan to optimize the cancer care and clinical research workforce to ensure it is diverse and reflective of communities. Further, the Centers for Disease Control and Prevention has recommended that all members of the public health workforce have basic competencies in genomics.[40] While training exists focused on cancer genetics education, these are typically available to clinicians and health care professionals. Thus, there remains a gap in training focused on the identification of high-risk individuals and implementation of HBOC risk-reducing interventions, which relies heavily on health information technologies (IT). Risk assessments such as family history collection applications to assess risk profiles, patient portals to share clinical information, electronic health records to track screening activities, and telehealth for genetic counseling and testing are often offered as online tools.[41-45] Equipping the CHW workforce with knowledge of HBOC and genetics improving competencies in screening women using online risk assessment tools could serve to help at risk women for greater referral and navigation to genetic services. To address the need and training gaps for CHWs including enhancing their ability to identify individuals at high-risk for HBOC using existing health IT tools, 2) increasing their awareness of available resources, and 3) providing skills for navigation of genetic services, we developed and assessed an online training program called KEEP IT (**K**eeping **E**ach other **E**ngaged **P**rogram via **IT**).[46]

Methods

Training Development

The curriculum and modules were developed through engaging a panel of individuals with expertise in genetics, community-engagement, CHW training, and telehealth to complete a modified three-round Delphi process. The Delphi process is an iterative approach designed to solicit and build consensus by converging recommendations from experts using a series of surveys and feedback. The modules were altered and finalized after the third round.[46] The final modules included in the training of CHWs were: 1) Hereditary breast and ovarian cancer, 2) Family history, family history collection tools, 3) Communicating about hereditary breast and ovarian cancer, 4) Genetics 101, 5) Genetic Testing and Counseling, 6) HIT (Telehealth and Telegenetic Platforms/EHR/Patient Portals), 7) Ethical, Legal, and Social Issues, 8) The CHWs Role in cancer care and prevention, 9) Supportive Resources, and 10) Locating Resources and Making Referrals.[46]

Recruitment and Training Delivery

Eligible participants were CHWs who are employed by, or volunteer for, an organization, clinic, institution, hospital or agency providing direct education, outreach or health services to Black women. We focused recruitment efforts on identifying CHWs who work in clinical settings (e.g., oncology clinics, mammography clinics), as these are most likely to be areas where high-risk Black women would be identified.

Recruitment was from community-based cancer resource organizations, national Black cancer networks and summits, trainee referrals, and existing relationships with national partners. Specific recruitment strategies included: email outreach, distribution through relevant list servs, circulation of flyers, and word of mouth. Interested trainees contacted the principal investigator for next steps for interest and enrollment in the training.

The training was delivered over the course of 3 days (4-hour sessions each day) and facilitated by Umemba Health, a workforce development and training agency with individuals trained in public health and specializing in workforce training and development. Participants were able to create a login and account with Umemba Academy, who then sent an email with links to access the course material prior to the training sessions. The sessions were conducted synchronously via Zoom on September 16, 2022, September 30, 2022, and October 7, 2022. Delivery methods included didactic lectures, activities, games, videos, discussion, debates, simulations, and role play. A full lesson plan with details about each session are included in Supplemental Table 1. Participants were offered a stipend upon completion of the course. All individuals received a certificate of completion.

Data Collection

We assessed changes in trainee's knowledge about HBOC, genomics, and health IT, as well as their attitudes toward genetics. These changes were assessed through a pre-, immediate-post, and 3-month post-course survey. We also assessed participant's perceptions about the quality and implementation of the training. Participants were offered a gift card incentive to complete each of the surveys.

Changes in Knowledge and Attitudes. Participants completed pre-, immediate-post, and 3-month post surveys to assess changes in key knowledge domains. HBOC knowledge was assessed using a validated True/False instrument of 11 statements where participants were able to select if they believed the statement was true or false.[47] The Genetic Literacy and Comprehension Measure (GLAC) assessed functional genetic literacy and includes an assessment of Word Familiarity and Comprehension of eight common terms in genetics. Each word was assessed in two ways: 1) participants were asked to rate the statement "I am familiar with this term" on a 7-point Likert scale of strongly disagree to strongly agree and 2) participants were asked to choose the term that best fits to fill in the blank for a sentence relating to the genetic term. Participants had 4 multiple choice options for the fill in the blank.[48] Health IT competencies were assessed using four statements that participants were asked to rate on a 5-point Likert scale ranging from "not confident at all" to "very confident". [49] We also assessed attitude toward genetic testing using a validated measure with five questions on their attitude towards genetic testing and its importance which were measured on a scale from "not a lot" to "a lot."[50]

***Quality and Implementation of Training*.** Implementation or CHW's fidelity to the various elements of the training's key components was assessed through the Kirkpatrick Model and a rank order of preferred learning sessions.[46, 51] Four questions were used for the Kirkpatrick model to assess reaction, learning, behavior and

results. These questions were assessed on a 5-point Likert scale of strongly disagree to strongly agree immediately post-course and at 3-month post-course. For rank order, participants were asked to rank all the modules from one to eight (most to least favorite). Finally, we asked participants to report the total number of women they spoke with about HBOC at 3-months post-test.

Data Analysis. Data analysis was completed in R. We had complete data (n=26) across pre-, immediate-post, and 3-month post-course follow up. Analyses included simple counts (frequency and percent) and median and range (mix to max). We compared pre-course, immediate-post, and 3-month post-course knowledge by calculating the number correct and percent correct for each item and overall percent correct with a confidence interval for HBOC knowledge, GLAC Comprehension Measure. To assess GLAC word familiarity, health IT competencies, and attitudes toward genetic testing we calculated the mean and range for each item, as well as the overall ranking. We compared post vs. pre course ratings, 3-month post course vs immediate post course, and 3-month post course to pre-course for each item of effectiveness and adoption measure using Wilcoxon sign rank test. To assess differences at these timepoints for the overall scores, we used GEE Wald tests.

Rank order of the preferred learning sessions were grouped based on how participants rated each training module. The rankings were then grouped by rankings of: 1st to 3rd, 4th to 6th, 7th to 9th.

Results

Overall, 46 individuals expressed interest in the training. Flyers, word of mouth, and emails sent to groups and associations associated with CHWs in the surrounding states were used to reach CHWs and promote the training. Of those who expressed interest, 38 completed the pre-course survey and were eligible to participate in the training. Twenty-six (68%) of the eligible CHWs successfully completed the course.

The average **HBOC knowledge score** across the 11 HBOC knowledge questions pre-course was 62% correct (range 57-67% correct) (Table 1). The lowest rated item was "1 in 10 women has an altered breast cancer gene" (12% correct) and highest rated item was "A woman who does not have an altered breast cancer gene can still get breast or ovarian cancer" (100% correct). Immediately post-course, there was a significant increase in the overall HBOC knowledge score across the 11 HBOC knowledge questions, with 72% correct (range of 66-78% correct) (p=0.0005). There was a significant increase in percent correct of two questions: "1 in 10 women has an altered breast cancer gene" (pre-course 12% correct, immediate post-course 35% correct, p=0.034) and "A father can pass down an altered breast cancer gene to his children" (pre-course 73% correct, immediate post-course 100% correct, p=0.0082). The overall HBOC knowledge score across the 11 HBOC knowledge questions at 3-months post course was 67% (range=60-73% correct), which was a significant decrease compared to immediate post-course ratings (p=0.016). We did not see a sustained improvement in HBOC knowledge at 3-months post-course (p=0.32) (Figure 1).

The average pre-course **GLAC measure word familiarity** across the 8 words in the GLAC measure was 5.8 (range 5.3-6.7). The highest rated words were genetic (M=7, range=2-7) and chromosome (M=7, range=2-7) and lowest word familiarity was sporadic (M=5.5, range=1.7). At the immediate post-course we saw a significant increase in word familiarity (M=6.5, range=6.3-6.7, p=0.0001), with all but one word (variation) receiving a median score of 7. There was a significant increase in word familiarity for sporadic at immediate post-course (M=5.5 pre-course, M=7 post-course, p=0.016). There was a significant decrease in word familiarity at 3-months post-course (M=5.9, range=5.4-6.5) compared to immediate post-course (p=0.03). There was not a sustained improvement in GLAC measure word familiarity at 3-months post-course (p=0.59) (Figure 1).

The average pre-course **GLAC measure comprehension** across the 8 words in the GLAC measure was 84% correct (range 76-92%). Abnormality and Sporadic had the lowest percent correct (73%) in pre-course questionnaire. Immediate post-course comprehension scores improved to 88% (range=83%-94%) but were not statistically significant (p=0.21). Three-month post-course surveys showed a non-significant (p=0.23) but sustained increase in GLAC comprehension (85% correct, range=78-92%) (Figure 1).

Average pre-course **Health IT competencies** were 3.9 (range=3.6-4.2), with the lowest rated pre-course item being "advanced clinical knowledge and understanding uses of HIT for patient management/education needs" (M=3, range=1-5) and highest rated item being "basic desktop/computer skills, computer/internet navigation" (M=4.5, range=3-5). Immediate post-course, we saw a significant increase in health IT competencies (M=4.5, range=4.2-4.7, p=0.0001). There was a significant increase in "advanced clinical knowledge and understanding uses of HIT for

patient management/education needs" at post-course (M=4.5, range=2-5, p=0.0018) as well as between pre-course and 3-months post-course (M=4, range=2-5, p=0.016). We saw a sustained but non-significant increase in health IT competencies at 3-months compared to immediate post course (p=0.2). We saw a significant increase in health IT competencies at 3-month compared to pre-course (p=0.017) (Figure 1).

Average pre-course **attitudes toward genetic testing** were 3.7 (range=3.5-3.9). Post-course, the average attitudes increased to 3.9 (range=3.8-4.0, p=0.078). Average attitudes toward genetic testing decreased at 3-months post-course (3.7, range=3.5-3.9, p=0.0086). There were no differences in attitudes toward genetic testing pre- and 3-months post course (p>0.99) (Figure 1).

Participants strongly agreed to all Kirkpatrick Model questions regarding the relevance of the course to their work as a CHW (M=5, range=3-5 immediately post-course, M=5, range=2-5 3-months post course), clarity of learning objectives M=5, range=3-5 immediately post course, M=5, range 3-5 3-months post course), use of adult learning theory (M=5, range=3-5 immediately post course, M=5, range=3-5 3-months post course) and whether they learned desired knowledge (M=5, range=4-5 immediately post course, M=5, range=3-5 at 3-months post course) (Table 2, Figure 2).

In addition, all CHWs (n=26, 100%) agreed that the course met the stated outcome of training CHWs to engage with health IT tools to improve ability to screen for women at high-risk for hereditary breast and ovarian cancer. Nearly all CHWs (n=25, 96%) agreed that the training was relevant to their needs as a CHW. 88% (n=23) of CHWs stated that the materials were "just right" and all CHWs stated that the quality of the training matched expectations (n=10, 38%) or was better than expected (n=16, 62%). Quality of instruction was highly ranked, with all participants stating that instructors used strategies that kept them engaged (n=26, 100%), and instructors were highly ranked (M=5, range 3-5).

When asked to rank order their preferred learning session, Family History and Family History Collection tools was the most highly rated, with 77% of individuals ranking it as one of their top three sessions. 46% of individuals rated Hereditary Breast and Ovarian Cancer was one of their top three sessions, and 35% of participants rated Communicating about HBOC as one of their top three sessions. Navigating resources, CHW Role Scope and Practice Limitations, and Ethical Legal and Social Issues were the lowest ranked sessions. 54% of individuals ranked navigating resources as 7th through 9th, 50% ranked CHW Role Scope and Practice Limitations as 7th through 9th, and 42% ranked Ethical Legal and Social Issues 7th through 9th (Figure 2).

On average, participants reported discussing HBOC with 17 individuals at three-month follow-up.

Discussion

Championing a diverse cancer and genomics workforce is necessary to achieve the early detection and health equity goals outlined in the National Cancer Plan. CHWs are an obvious but overlooked workforce that could be equipped with cancer and genomics competencies to make an impact on detecting early cancers among racial and ethnic minority women. In our delivery of the KEEP IT CHW Training, 26 CHWs completed 12-hours of virtual training in ten key areas. Our evaluation of the program provides helps better understand effective training approaches to improve CHW competencies in genomics and opportunities to enhance the curriculum and disseminate it broadly.

Our KEEP IT CHW training had exceptional retention throughout the course, with 26 individuals participating in the full 12-hour training that took place over three days. We also had full participation in all of the evaluation surveys (pre-course, immediate post-course, and 3-month post course). Strategies to support high levels of reach and retention included: 1) thoughtful selection of participants, 2) appropriate compensation and incentives, and 3) accessible delivery of content. Our selection process for trainees included reviewing their application for completeness and ensuring they would be available for the duration of the course. Because CHWs are often working full time and may be required to take time off to participate in continuing education training, we offered compensation at the conclusion of the course. We also provided trainees with compensation after they completed the 3-month post-course survey. Another incentive for the course was a certificate of completion. This is typical for CHWs to receive at the conclusion of continuing education and can be applied to support their career advancement or continuing education requirements to maintain certification. Finally, we offered the course virtually. The training was intentionally designed to be offered virtually (manuscript under review) to help support accessibility and dissemination. By providing the course virtually, we were able to expand our reach to any CHW in

the US, reduce commute time, time off work, and potential childcare costs associated with attending training. Our trainer was highly skilled in offering online training to adult learners and we used a variety of strategies to ensure continuous engagement, despite not being in-person.

We saw improvements in knowledge and competencies at immediate post-course. These improvements were largely not sustained at 3-months follow-up. HBOC knowledge, GLAC measure word familiarity, and attitudes toward genetic testing all returned to pre-course levels at 3-month follow up. We found non-significant but sustained increases in GLAC measure comprehension and significant improvements in health IT competencies pre-course to 3-month follow-up. While we saw a regression to the mean for the majority of scales, CHWs had noticeably high pre-course competencies. Genomic literacy is a complex construct that can be difficult to assess. A recent review characterized different types of genetic knowledge, including: awareness, technical, methodological knowledge, institutional, and cultural knowledge[52]. The most commonly assessed type of knowledge in the literature was "technical knowledge" or the understanding of specific genetic concepts, demonstrating that more health-motivated individuals were more likely to have higher technical knowledge. Our current training primarily focused on technical knowledge; however, expanding future versions of the training to include a range of genetic knowledge could further enhance CHW's genomic literacy.[53-55] [52]

The findings in our pilot training are consistent with those from another pilot training of HBOC knowledge and genomics in community outreach professionals in Latina populations. That study also saw increases in genetic knowledge, HBOC knowledge, attitudes toward genetic testing, and self-efficacy for identification of at-risk women in their population of interest.[56] After completing a pilot of program AROBLES, the team revised and adapted their training, including the addition of a "ARBOLES Project" to serve as a guide for working with community members. This approach allowed for ongoing engagement with content beyond the initial training. Indeed, future iterations of the KEEP IT CHW training could incorporate follow-up modules or end-of-training project to support ongoing learning and competency development in improving competencies in identification, referral, and navigation of women to proper preventive and genetic services.

Additionally, the KEEP IT course was well-rated in terms of delivery and alignment with the CHW role. This further validates past work indicating that CHWs are an appropriate workforce to train in genomics and related competencies.[57] Based on the diverse range of individuals who participated in the training, we focused on using adult learning theory to ensure relevance.

This study is not without limitations. While we were pleased with the overall impact of the program (26 individuals participating and completing all surveys), this was a pilot program so we were likely not powered to ensure that significant differences could be detected for longitudinal outcomes assessed. Relatedly, we included open response options for CHWs to provide feedback about the course, but we did not conduct follow-up, in-depth qualitative interviews. Additional qualitative data and triangulation could help support these findings. On average, CHWs reported talking to 17 individuals about HBOC at 3-month follow-up. This is limited because it was self-reported and did not include specifics such as what components of the training they used to speak with clients or where they spoke to individuals about HBOC (e.g., health fair, clinical setting). We initially also included measures of the number of individuals who CHWs referred to genetic counseling, and the number of individuals that received genetic counselor or testing. However, we removed these from analysis due to inconsistencies in reporting. Given the diversity in the types of settings CHWs were working in (e.g., clinic or community setting), the ways they worked with clients (e.g., one time or ongoing), and access to medical records for their specific clients, it was not feasible to assess more distal outcomes as we had originally indended. Also related to impact of training, we did not include an assessment of organizational-level outcomes such as whether the CHW's organization adopted different approaches to their cancer screening or family health history collection practices. CHWs were part of a wide range of organizations, so we were unable to assess these outcomes. However, future training and research could capture this information. Since we have now demonstrated the effectiveness of the program (improved competencies), future delivery of the course could focus on ways to measure longer-term maintenance outcomes.

The KEEP IT CHW training provided an opportunity for CHWs to gain knowledge about hereditary cancers and genomics. This training was effective in improving competencies of these topics immediately post-course, with future opportunities to sustain the competency increase through booster sessions to reinforce key topics. Future

initiative could expand this training to include other cancer and genomics-focused modules, as well as identify ways to disseminate to CHWs broadly.

Statements

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Statements of Ethics

This study protocol was reviewed and approved by the MUSC Institutional Review Board. We received a waiver of consent for participants to enroll in the study. 'The need for informed consent was waived by the Medical University of South Carolina IRB (**Pro00116925)**.

Conflict of Interest Statement

The authors have no conflicts of interest to disclose.

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Author Contributions

C.A. conceived of the study idea. M.F. and S.Q. supervised C.A. and assisted with materials for curriculum. Q.U. produced the curriculum for the training with assistance from C.A. and A.H.. Q.U., A.H., and C.A. coordinated training delivery. A.H. assisted with study recruitment and participant management. E.H. was the lead for data analysis. C.A., A.H. and S.P. wrote and edited the manuscript with input from all authors.

Data Availability

Data are not available in a public repository due to the small sample size. They are available upon request to the first author (allencat@musc.edu) upon reasonable request.

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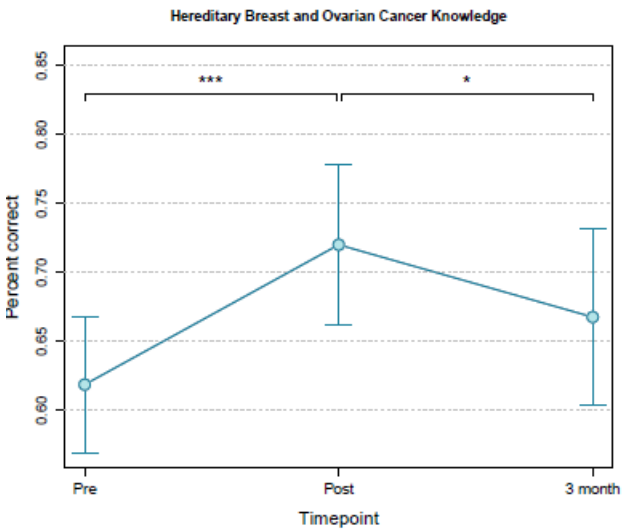
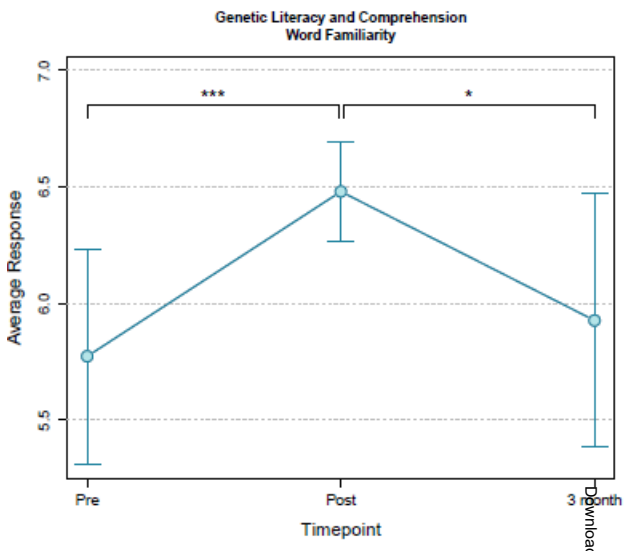
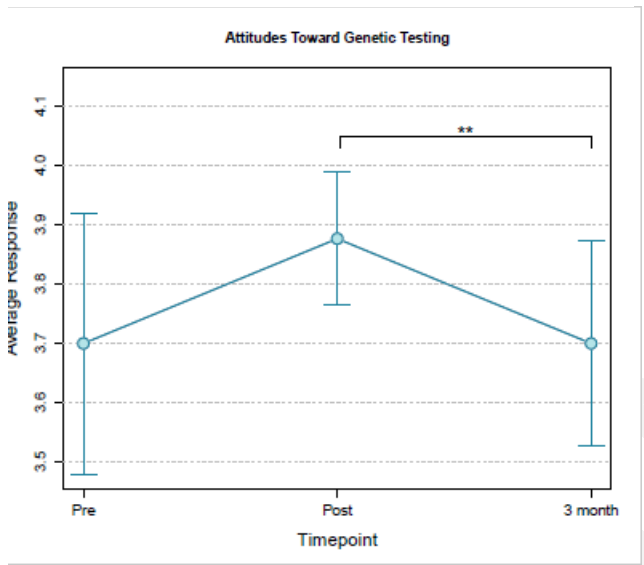
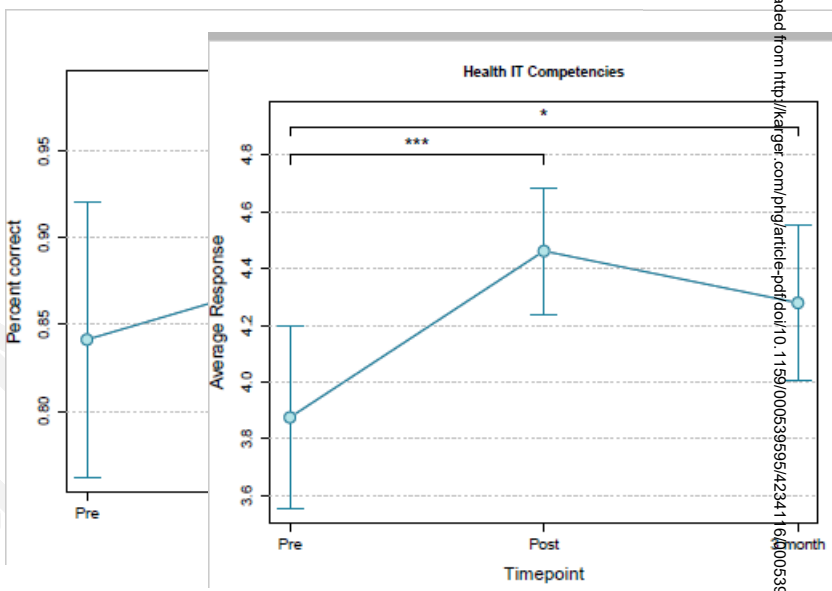
Figure 1: Effectiveness and Adoption Outcomes

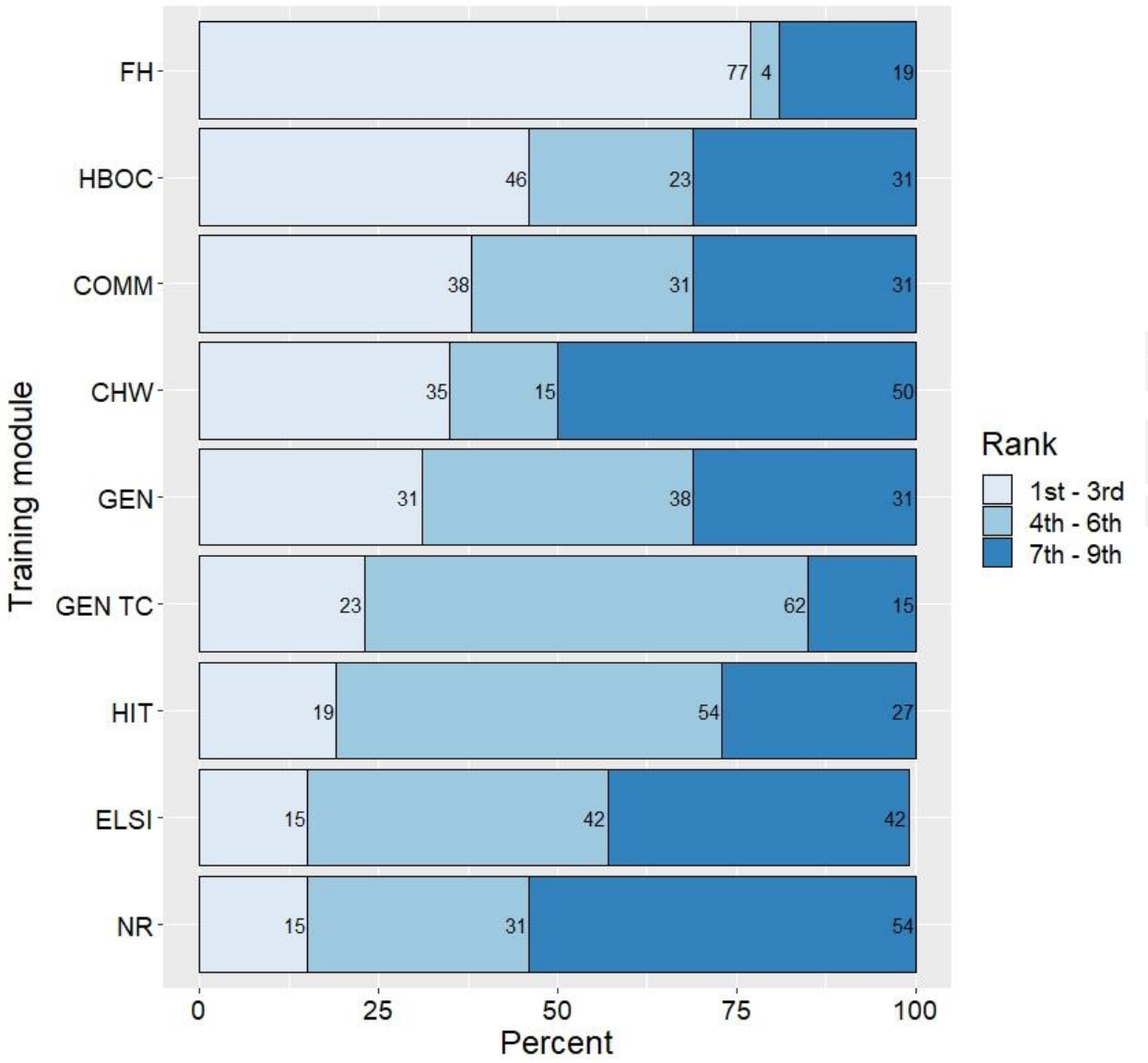
Figure 2: Implementation Outcomes of Rank Order of Preferred Lessons











Training Model Abbreviations are as follows:

FH= family history and family history collection tools

HBOC=Hereditary breast and ovarian cancer

COMM= Communicating about hereditary breast and ovarian cancer

CHW= CHW Role, Scope and Practice Limitations

GEN=Genetics 101

GEN TC= Genetic testing and counseling

HIT=Health Information Technology

ELSI=Ethical Legal and Social Issues

NR=Navigating resources

Table 1: Effectiveness and Adoption Outcomes

	Pre-course (n = 26)		Immediately post-course (n = 26)		3 months post-course (n = 26)		post vs pre	3 month vs post	3 month vs pre
HBOC knowledge	**No. correct**	**Percent correct**	**No. correct**	**Percent correct**	**No. correct**	**Percent correct**	**p-value**	**p-value**	**p-value**
1 in 10 women has an altered breast cancer gene (False)	3	12	9	35	5	19	0.034	0.16	0.32
One half of all breast cancer cases occur in women who have an altered breast cancer gene (False)	9	35	7	27	8	31	0.48	0.71	0.56
A father can pass down an altered breast cancer gene to his children (True)	19	73	26	100	25	96	0.0082	0.32	0.014
The sister of a woman with an altered breast cancer gene has a 50% risk of having the altered gene (True)	21	81	25	96	25	96	0.1	>0.99	0.1
A woman who does not have an altered breast cancer gene can still get breast or ovarian cancer (True)	26	100	24	92	24	92	0.16	>0.99	0.16
Early onset breast cancer is more likely due to an altered breast cancer gene than is late onset breast cancer (True)	19	73	17	65	17	65	0.53	>0.99	0.53
A woman who has an altered breast cancer gene has a higher ovarian cancer risk (True)	16	62	19	73	19	73	0.37	>0.99	0.32
All women who have an altered breast cancer gene get cancer (False)	22	85	23	88	21	81	0.65	0.41	0.71
A woman who has her breasts removed can still get breast cancer (True)	18	69	22	85	21	81	0.16	0.65	0.18
Ovarian cancer screening tests often do not detect cancer until after it spreads (True)	11	42	15	58	13	50	0.21	0.48	0.53
Having ovaries removed will definitely prevent ovarian cancer (False)	13	50	19	73	13	50	0.083	0.058	>0.99
OVERALL - Average % correct (95% CI)	62	57, 67	72	66, 78	67	60, 73	0.0005	0.016	0.32
Genetic Literacy and Comprehension (GLAC) Measure- Word Familiarity	**Median**	**Range (min - max)**	**Median**	**Range (min - max)**	**Median**	**Range (min - max)**	**p-value**	**p-value**	**p-value**
Genetic	7	2 - 7	7	6 - 7	7	1 - 7	0.17	0.19	0.86
Chromosome	7	2 - 7	7	5 - 7	7	1 - 7	0.35	0.67	0.64
Susceptibility	6	1 - 7	7	4 - 7	6.5	1 - 7	0.079	0.26	0.6
Mutation	6	3 - 7	7	5 - 7	7	1 - 7	0.23	0.6	0.61
Variation	6	1 - 7	6	5 - 7	7	1 - 7	0.087	0.54	0.59
Abnormality	6	2 - 7	7	5 - 7	7	1 - 7	0.064	0.23	0.63
Heredity	6.5	3 - 7	7	6 - 7	7	1 - 7	0.1	0.45	0.5
Sporadic	5.5	1 - 7	7	3 - 7	6.5	1 - 7	0.016	0.27	0.27
OVERALL - Average (95% CI)	5.8	5.3, 6.2	6.5	6.3, 6.7	5.9	(5.4, 6.5)	0.0001	0.03	0.58
Genetic Literacy and Comprehension (GLAC) Measure- Comprehension	**No. correct**	**Percent correct**	**No. correct**	**Percent correct**	**No. correct**	**Percent correct**	**p-value**	**p-value**	**p-value**
Genetic (Generations = 1)	24	92	25	96	23	88	0.6	0.32	0.56
Chromosome (Genetic = 1)	24	92	24	92	22	85	>0.99	0.32	0.32
Susceptibility (Might = 3)	22	85	22	85	21	81	>0.99	0.71	0.71
Mutation (DNA = 3)	22	85	24	92	24	92	0.3	>0.99	0.41
Variation (Some of the time = 2)	23	88	19	73	21	81	0.1	0.41	0.32
Abnormality (Trisomy = 3)	19	73	24	92	24	92	0.06	>0.99	0.059

Heredity (Parent to Child = 3)	22	85	24	92	26	100	0.3	0.16	0.046
Sporadic (A family history = 2)	19	73	22	85	16	62	0.3	0.034	0.37
OVERALL - Average % correct (95% CI)	84	76, 92	88	83, 94	85	78, 92	0.21	0.23	0.8
Health IT Competencies	**Median**	**Range (min - max)**	**Median**	**Range (min - max)**	**Median**	**Range (min - max)**	**p-value**	**p-value**	**p-value**
Operational medical terminology knowledge	4	1 - 5	5	2 - 5	4	2 - 5	0.049	0.57	0.13
Basic desktop/computer skills, computer/internet navigation	4.5	3 - 5	5	4 - 5	5	3 - 5	0.11	0.20	0.72
Understanding of how patient information should flow in clinical settings	4	1 - 5	5	2 - 5	4.5	2 - 5	0.24	0.54	0.58
Advanced clinical knowledge and understanding of uses of HIT for patient management/education needs	3	1 - 5	4.5	2 - 5	4	2 - 5	0.0018	0.41	0.016
OVERALL - Average (95% CI)	3.9	3.6, 4.2	4.5	4.2, 4.7	4.3	4.0, 4.6	0.0001	0.2	0.017
Attitudes toward Genetic Testing	**Median**	**Range (min - max)**	**Median**	**Range (min - max)**	**Median**	**Range (min - max)**	**p-value**	**p-value**	**p-value**
How important is knowing a person's genetic information for preventing cancer?	4	1 - 4	4	3 - 4	4	1 - 4	0.21	0.22	0.97
How important is knowing a person's genetic information for detecting early cancer?	4	2 - 4	4	2 - 4	4	3 - 4	0.67	0.44	0.75
How much do you think genetics, that is characteristics passed from one generation to the next, determine whether or not a person will develop cancer?	4	1 - 4	4	3 - 4	4	1 - 4	0.33	0.17	0.67
How important is knowing a person's genetic information for treating cancer?	4	1 - 4	4	2 - 4	4	2 - 4	0.22	0.24	0.92
How much would you want to know if you have a genetic change that increases your chances of getting cancer?	4	1 - 4	4	3 - 4	4	2 - 4	0.38	0.21	0.72
OVERALL - Average (95% CI)	3.7	3.5, 3.9	3.9	3.8, 4.0	3.7	3.5, 3.9	0.078	0.0086	>0.99

Table 2: Kirkpatrick Model Questions

	Immediate post-course	3 month post-course
This training is relevant to my work as a CHW*	5, 3 - 5	5, 2 - 5
This training had clear learning objectives*	5, 3 - 5	5, 3 - 5
This training used adult learning theory*	5, 3 - 5	5, 3 - 5
I learned the desired knowledge from this training*	5, 4 - 5	5, 3 - 5
Did the course meet the stated outcome of training CHWs to engage with health IT tools to improve your ability to screen for women at high-risk for hereditary breast and ovarian cancers?	26 (100)	
	0 (0)	
Was the training relevant to your needs as a CHW?	25 (96)	
	1 (4)	
Please rate the material and information presented in the training. Was it?	3 (12)	
	23 (88)	
	0 (0)	
Please rate the quality of the training. Was it?	16 (62)	
	10 (38)	
	0 (0)	
The instructors/facilitators utilized strategies that kept me engaged for the duration of the training?	26 (100)	
	0 (0)	

* Summary measures are median and range (min - max) for variables measured on a likert scale, and n (%) for categorical variables.