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Improving learning about familial risks using a multicomponent approach: the GRACE program

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Abstract

Aim—To enhance learning (knowledge, attitudes and practices) about the importance of family health history (FHH) information and familial risks.

Methods—A pre–post design with one group was employed in this study. Five learning sessions were conducted with a community-based sample (n = 75) recruited from five counties in Texas, USA. Each learning session included: a short online video; enactive instructions on how to use the online Surgeon General FHH tool; and a presentation on how to assess familial risks. Participants completed the pre–post knowledge, attitudes and practices questionnaires and the study's satisfaction survey, and participated in a short focus group interview.

Results—Participants' average age was 48.1 ± 13.3 years. Over half of the participants (79%) were female, and 55% described themselves as non-Hispanic White. Our findings showed significant changes ($p < 0.05$) in participants' specific knowledge about factors that affect their familial risks. Similarly, significant changes ($p < 0.05$) in participants' attitudes toward familial risks assessment for common disease complications and confidence in controlling these risks have been documented. Participants' reported a high level of satisfaction in using online FHH tools, yet no significant change ($p > 0.05$) was detected in their reported practices regarding sharing FHH information with their providers or relatives. Focus group interviews revealed that participants were uncertain about providers' or relatives' reactions to sharing FHH information.

Conclusion—Using different learning styles may have a significant impact on improving knowledge and attitudes about familial risks.

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Disclaimer

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Ethical conduct of research

The authors state that they have obtained appropriate institutional review board approval or have followed the principles outlined in the Declaration of Helsinki for all human or animal experimental investigations. In addition, for investi gations involving human subjects, informed consent has been obtained from the participants involved.

Keywords

familial risks assessment; family health history tool; genomics; learning; online Surgeon General

Detailed familial risks assessment is a key step for identifying individuals who are likely to benefit from genetic counseling and testing [1]. Family health history (FHH) information captures the interaction between genetic susceptibilities and environmental factors, and therefore represents a basic step towards personalized medicine [2]. Despite mounting evidence regarding the importance of familial risks assessment, however, many individuals at risk of developing chronic common diseases or its associated complications are unaware of their risks [3]. To address this issue, we developed the GRACE program to enhance learning about familial risks among individuals with increased risks for common chronic diseases. The GRACE program is based on the Community Health Action model [4], combined with the Social Learning Theory [5]. The goal of the Community Health Action model is to depict community health promotion processes in a manner that can be implemented by community members to achieve their collective and collaborative actions and outcomes to improve the health and wellbeing of their community. The promotion and maintenance of health requires that individuals obtain a practical understanding of health-related, familial risks-specific information. Such information is important to enable individuals' self-care abilities by helping them make more knowledgeable decisions and assume greater personal responsibility for their overall health and wellbeing. The learning components of the GRACE program were based on Social Learning Theory, which posits that behavior is a function of individuals' expectations about the value of an outcome [5]. There are several types of individuals' learning styles. These include: iconic learning styles, in which individuals learn through observing visual representations such as video; enactive learning styles, in which individuals learn by manipulating or doing things; and symbolic learning styles, in which individuals learn through words or verbal symbols [6]. The GRACE program was designed to accommodate diverse learning styles by using visual, enactive and symbolic approaches. In addition, with the advancements in health information technology, there are increasing opportunities for individuals to make 'informed choices' about health decisions, along with their providers, to take active steps in reducing their diseases risks [7]. The GRACE program utilized several online tools and tested their feasibility in a community-based setting.

In this paper, we report our findings regarding the impact of the GRACE program on improving learning about familial risks. We tested the feasibility of GRACE implementation in a community sample, with support through the Translational Advisory Board (TAB) members serving the minority population in south Texas. TABs are sponsored by the Institution for Integrating Medicine and Science and the South Central Area Health Education Center, as part of the Clinical and Translational Science Award Community Engagement Core. The TABs are located in five south central Texas counties – Bexar, Comal, Frio, Gillespie and Guadalupe – and comprised of community members who are committed to improving the health of their community through translational research [101].

Methods

Design

The GRACE program was based on a pre–post design with one group. Mixed methods of qualitative and quantitative approaches were used to evaluate the impact of the GRACE program on improving learning about familial risks among individuals at risk for developing chronic common diseases or its associated complications. The Institutional Review Board at the University of Texas Health Science Center at San Antonio (TX, USA) approved the

study. The study was advertised at all TAB sites located in Bexar, Comal, Frio, Gillespie and Guadalupe. Members participating in the TABs facilitated the recruitment of subjects in each county. Subjects were recruited from various community-based services such as rehabilitation centers, public libraries and churches. Individuals who were 21 years or older with at least one common chronic disease (e.g., diabetes, cardiovascular diseases and cancers) cluster in their family were included in this study. First-, second- and third-degree relatives were invited to participate. Participants who were spouses, unwilling or not capable of responding to the study's survey were excluded. Five sessions were conducted with a community-based sample (n = 75) recruited from five counties (Gillespie, Comal, Bexar, Guadalupe and Frio) in South Texas.

Study questionnaires

Learning was measured by assessing participants' knowledge, attitudes and practices (KAP). Knowledge is defined as the capacity to acquire specific and detailed information regarding factors that increase individual risk of developing chronic common diseases or its associated complications. Attitude refers to inclinations to react to familial risks in a way to reduce disease risks. Practice is the application of rules and knowledge about FHH information that leads to action (e.g., sharing FHH information with relatives and providers). The study used a modified version of KAP questionnaires developed by the Michigan Research and Training Center to measure participants' KAP regarding FHH information pre- and post-learning sessions. The KAP questionnaire (5-point Likert scale) is composed of six closed-ended knowledge items that tested recall of information described in the GRACE learning session and highlighted in the PowerPoint presentation, including specific factors that increase familial risks of common diseases and its associated complications, three questions regarding feelings towards familial risk reduction, and three practice questions regarding plans to change lifestyle behaviors, and share FHH with relatives or healthcare providers. The study also used a modified version of the American Customer Satisfaction Survey to assess participants' satisfaction in using Surgeon General Family Health History (SG-FHH) online tools. The American Customer Satisfaction Survey contained 11 questions that assessed drivers of satisfaction (i.e., accessibility, content, functionality, look and feel, and performance) in using the SG-FHH tool. Questions collecting basic demographic information (i.e., gender, age, race/ethnicity, level of education and income) were also included in the survey.

GRACE learning sessions

The content of the learning components was selected based on our experience conducting research related to familial risks assessment for more than a decade. For example, we have selected to use the online SG tool because it is user-friendly and has a Spanish translation version [7]. Furthermore, it has the capability of producing standardized, interoperable FHH information data files. Similarly, we have selected the American Society of Human Genetics online video because it is comprehensive and culturally sensitive. Issues of literacy and cultural competence were considered in designing the intervention. At the beginning of the study, we asked participants to response to the research surveys and to complete the SG-FHH online tool using either the English or Spanish version. All participants (including the bilinguals) selected the English forms. Language equivalence of the tools was assured using a standard approach of back-to-back translation as suggested by Casado *et al.* [8]. In addition, all of the study's surveys were previously tested for clarity and tested to suit the six-grader level (ages 11–12 years).

At the scheduled FHH learning session, the research associate (E Delgado) obtained verbal consent and collected basic demographic data (e.g., age, gender and ethnic origin) using the study's Demographic Questionnaire. The learning sessions were delivered by a trained

certified health educator with a 4-year college degree. At each session we conducted the following steps:

- Collected baseline data about participants' KAP;
- Presented a short online educational video (iconic learning styles) that illustrated the importance of familial risk factors on the development and progression of common chronic diseases and its complications. The video provided information on currently available tools to collect, document and save FHH information. It also described factors that predict familial risks for common diseases such as an early age of the onset, number of affected relatives and ethnic origin. Finally, the video highlights the importance of sharing FHH information with relatives and healthcare providers. The video was generated and sponsored by the American Society of Human Genetics: Talk Health History Campaign [102];
- Introduced the online SG-FHH tool and asked participants to complete the SG-FHH tool with their own family history information. The research associate assisted participants with limited computer skills (enactive learning styles). Approximately one-third of the participants needed assistance in using the SG online tool, especially in areas related to adding a new condition, and instructions about adding a new relative;
- Assisted participants in using the Provider's Card to summarize their personalized familial risks using their generated pedigree. The SG tool does not generate familial risks assessment. Therefore, we helped participants in summarizing their familial risks using the Providers' Card generated by Genetic Alliance [103]. Familial risks assessment was based on a qualitative approach that classifies risks into three categories: low, moderate and high. We also advised participants to share their FHH information with their relatives and providers (symbolic learning styles);
- Re-administered the KAP questionnaire;
- Administered the satisfaction survey.

Each learning session lasted for approximately 30 min. These 30 min were divided as following: 5 min for presenting the online video; 15 min for using the online SG-FHH tool; and 10 min for summarizing personalized familial risks using the generated pedigree. Approximately 25 min was actually spent on completing the study's surveys. All participants were provided with an encrypted JumpDrive™ to save their pedigree to share the information with their relatives/providers. In addition, we provided participants with a printed brochure about the importance of FHH information, which was adapted from materials provided by the Genetic Alliance's 'Does It Run in the Family?'. We conducted focus group interviews after each session to elicit participants' views on the importance of the GRACE project and suggestions for future improvements. Dr N Arar, a medical anthropologist experienced in the qualitative approach (e.g., focus groups), provided extensive training for the research associate. The research associate, a certified health educator, led the focus group interviews.

Data analysis

The basic nature of the data was first examined through descriptive statistics, such as frequencies for categorical variables (e.g., attitudes and knowledge), and means for continuous variables (e.g., age). We investigated the effect of the GRACE learning session on participants' KAP by classifying the responses into 'agree' and 'disagree' categories, then calculating the percent change in participants' responses before and after each session. χ^2 test was used to detect significant differences in participants' responses before and after participation in the learning session, while the Fisher's exact test was used when the total

cell counts were less than 5. A p-value of <0.05 was considered significant. All data analysis was performed using SPSS software.

Content analysis was performed for the qualitative data collected through the focus group sessions. The research associate documented all responses during the focus group interviews. The research associate and N Arar examined the notes and developed broad categories representing main responses across all cases. To fully develop the themes, the research analysts (E Delgado and N Arar) examined all responses associated with the most prominent categories. Research analysts followed the following steps: conducted a thorough review of their observation notes; organized data by interview guide questions and categorized responses using major study domains (e.g., importance of GRACE); and performed charting to organize the data and compare and contrast participants' responses. Findings from the qualitative data provided important context to understand how the GRACE program influenced learning about FHH information [9,10].

Results

Demographic characteristics of the study participants

The average age of the participants was 48.1 ± 13.3 years. Over half of the participants (79%) were female, and 55% of participants described themselves as non-Hispanic White. Nearly all participants (65%) indicated that they had completed at least some college or technical school, and approximately 90% of subjects indicated that they could use the computer and have access to the internet **(Table 1)**. On average, 15 subjects (range: 9–20) participated in each session. Differences in results by demographic variables were not explored because of the small sample size.

Participants' knowledge regarding familial risks pre- & post-GRACE learning sessions

Most of the participants (96%) agreed that FHH refers to diseases and conditions that run in their family. In addition, the majority (96%) indicated that having a first-degree relative (e.g., siblings and parents) with the same conditions (e.g., diabetes) would increase their own risks to that disease. Our analysis showed no significant change ($p > 0.05$) in participants' general knowledge about FHH information pre- and post-GRACE learning sessions **(Table 2)**.

However, significant changes in participants' specific knowledge about factors that affect their familial risks were observed ($p < 0.05$). For example, before conducting the GRACE learning sessions, 70% of the participants agreed that having multiple affected family members with the same or related conditions could increase their chances of developing that disease, compared with 85% post to GRACE learning sessions ($p = 0.019$). Similarly, we observed a significant positive ($p = 0.001$) increase, with a 31% change in participants' responses regarding familial factors such as having young and multiple affected family members with the same or related conditions **(Table 2)**.

Assessment of participants' attitudes & practices regarding familial risks pre- & post-GRACE learning sessions

Our findings showed significant changes in participants' attitudes towards familial risk assessment for common disease complications, and confidence to control these risks. For example, before conducting the GRACE learning sessions, most of the participants (80%) indicated that they are worried about developing chronic diseases in the future due to FHH. This high response did not change after the session ($p = 0.840$). However, a significant change in participants' attitudes towards developing chronic common disease complications

was observed (p = 0.018). Interestingly, more participants (55%) felt that they have control over their risks post to GRACE learning sessions **(Table 3)**.

With respect to participants' reported practices, no significant changes have been observed in relation to plans to discuss FHH information with relatives or healthcare providers. In addition, no significant changes (p = 0.281) have been observed in participants regarding making lifestyle changes (e.g., diet) to minimize the risks of developing common chronic diseases or their complications. A follow-up study to assess how patients change their behaviors over time is justified.

Satisfaction in using the SG-FHH online tool

Most of participants (90%) said that they have access to a computer with internet, and 77% reported that they know how to use a computer, while 23% indicated that they are unable to use a computer **(Table 2)**. The vast majority of participants felt that items on the SG-FHH tool were easy to understand (99%), and felt that FHH categories were relevant to their family's health (92%). All participants viewed the SG-FHH tool as useful, and the majority of participants (97%) indicated that they would likely recommend the tool to others, or approved linking it to their personal health record in the future **(Table 4)**.

Focus group sessions

Focus group interviews after the learning sessions provided important context to understand how the GRACE learning sessions influenced KAP regarding FHH information. Content analysis revealed that most participants were uncertain about providers' reaction(s) to sharing FHH information. Participants also indicated that some family members might not be willing to share information about their health. An interesting ethical issue about concerns of providing detailed FHH information to insurance companies was raised. Further probing on this issue showed that most participants are not aware of the Genetic Information Nondiscrimination Act that will protect individuals against discrimination based on their genetic information when it comes to health insurance and employment. However, participants agreed that the GRACE program provided them with better understanding of their familial risks, and confidence in their ability to control risks of developing common chronic diseases. Having a free online tool (e.g., SG-FHH tool) to collect FHH information was viewed favorably.

Discussion

Collecting and analyzing detailed FHH information will continue to be the 'gold-standard' to assess personal disease risks [11–14]. The importance of FHH information has been highlighted in the NIH State-of-the-Science statements on family history in relation to practice of medicine, motivation of positive lifestyle changes, and influence of clinical interventions [14]. More recently, the CDC considers FHH a priority research area for public health genomics, as described in the stakeholder consultation report issued in September 2011. FHH is an independent risk factor for common diseases such as diabetes, cardiovascular disease and cancers [15–20]. The relative risk for breast cancer [16], prostate cancer [17], colorectal cancer [18] and T2DM [19,20] is doubled (relative risk: 1.5–3) if one first-degree relative is affected in middle age. Previously, we found that the majority of relatives (75%) with FHH of diabetes were unaware of their personal diabetes familial risks, although all recognized that the diabetes clusters in their family [3]. The lack of knowledge about familial risks among at-high-risk individuals also reflects poor patient–provider communication about FHH during medical encounters. We examined the content and process of patient–provider exchange about FHH during medical encounters using 50 videotaped encounters with six physicians at a Veterans Affairs primary care outpatient

clinic in San Antonio (TX, USA) [21]. Content analysis showed that FHH was discussed in 35% of the encounters and in 80% of the new visits. FHH discussion included diseases such as cancer, diabetes and cardiovascular disease. Providers most frequently initiated discussion on FHH (87%), and longer exchanges most commonly occurred when counseling on the topic of cancer arose [22]. We found patient–provider exchanges about self-care were related to discussion regarding FHH information (t-test, $p < 0.05$). Similarly, poor patient–provider communication about familial risks assessment during medical encounters has also been reported by other researchers [23,24]. Findings from these studies identified several barriers to optimal familial risks assessment, such as the limited time available to collect FHH information during the medical encounter [12]. This suggests the need for a systematic approach for collecting and documenting FHH information prior to a patient's visit so that valuable time can be spent focused on communicating familial risks with patients [7].

We developed the GRACE program to enhance learning bout familial risks among individuals at risk for developing common chronic diseases or its associated complications. In this study, we observed that almost all participants understand that FHH is a risk factor for chronic common diseases (e.g., diabetes), and believe that knowing their FHH information is essential for their own health. Similarly, in a national study about awareness of family history, 96% of survey respondents reported that knowing their family history is important for their own health [25]. In addition, we found that the GRACE learning sessions were an effective strategy for improving participants' understanding of familial risks assessments. The GRACE learning sessions did not have a significant change on participants' general knowledge about familial risks (e.g., definitions of FHH, having first-degree relatives affected with a chronic disease). However, significant changes in participants' specific knowledge about factors (e.g., having young and multiple affected relatives with the same conditions) that affect their familial risks were observed. Improvement in specific knowledge about factors that increase personal familial risks has important implications for accurate risk perceptions and assessments. It is difficult to explain this finding without a study design with a control group. However, it is possible that improvement in knowledge and attitudes among participants in our study are due to using different learning styles such as iconic, enactive and symbolic approaches. These diverse learning styles not only addressed the learning needs for individuals with different educational and ethnic backgrounds, but also emphasized learning by delivering the same messages using multiple approaches.

Similarly, Walter *et al.* examined lay understanding of familial risk of common chronic diseases. Their review suggested that the common multifactorial model of familial risk might enable people to change their behavior and exert some form of control over their perceived vulnerability [26]. Individuals' learning about the impact of familial risk factors on the development of common chronic diseases may promote lifestyle changes, such as adopting a healthier diet, getting regular exercise and quitting smoking to reduce the chances of developing heart disease and other common illnesses [27]. In addition, sharing FHH information with healthcare providers may assist them in recommending frequent screenings (such as mammography) starting at an earlier age for people with an increased risk for certain cancers [27–30]. In our study, a small but not significant change has been observed in participants' intentions to share FHH with their providers and relatives. Content analysis of the focus group interviews revealed that participants' were hesitant to share their FHH because they were not clear about relatives' or providers' reactions. Koehly *et al.* examined the influence of social context on coping responses to communicate hereditary risk and evaluate the effects of social context on improving health outcomes [31]. They found that family members are more likely to discuss genetic counseling and testing if either one carries the mutation, if either one is a spouse or a first-degree relative of the other, or if the relationship is defined by positive cohesion, leadership or lack of conflict. Furthermore, the

family functioning patterns suggested that mothers tend to be the most influential persons in the family network. Therefore, encouraging family members who act in the mother role to take a 'team approach' is important when discussing cancer risks and management with family members [31]. A follow-up intervention that is focused on informing and activating individuals regarding sharing FHH information with relatives and providers is justified.

The findings from our study suggest that promoting the use of a web-based FHH tool (e.g., SG-FHH online tool) has implications for patients, their providers and relatives. Several online tools are now available to support risks assessment of certain cancers, coronary artery disease and diabetes mellitus [32–35]. Using online tools will allow a systematic collection of FHH information that can be conducted outside of the patient visit and help to reduce time burdens for providers and patients. Recent studies assessing consumers' satisfaction in using computerized or web-based health tools have shown overall positive experiences [36–38]. For example, Fuller *et al.* found that most providers favored patient-generated, computer-based pedigrees over hand-drawn pedigrees. Computer-generated pedigrees contain more FHH information and allow for easier identification of at-risk patients [36]. In addition, in a study that examined patients' satisfaction in using a secured website providing shared personal health records between patients and providers, Ralston *et al.* found that 94% of patients were satisfied with the program [37]. Patients favored the benefit of an online program's 24-h access to health information and the ability to explore the tool at their own pace and time; this is especially true for those who may not be as proficient in using the computer. We examined consumers' (Veterans: n = 35) satisfaction in using the online SG-FHH tool, using a modified version of the American Customer Satisfaction Index. Approximately 67% of the participants said that they have easy access to a computer or the internet and demonstrated their ability to complete all FHH forms [38]. Most subjects (88%) viewed the functionality, look and feel, navigation and performance of the SG-FHH tool favorably. In the same study, participants identified several factors that may facilitate the use of the SG-FHH tool, such as working with a family member to complete the FHH forms and receiving encouragement from healthcare providers.

The GRACE program has important implications for enhancing familial risk screening and assessment. The program provides an evidence-based approach to increase knowledge and attitudes regarding familial risks. However, widespread implementation may be possible among the low-computer-literate group, with additional outside support (e.g., community-based health workers). Kaphingst *et al.* examined the effects of a culturally tailored intervention led by lay health advisors in delivering information about FHH on participants' intentions, self-efficacy and conceptual knowledge. They found that a communication intervention delivered by lay health advisors shows promise as an effective means of educating underserved Spanish-speaking Latinos about the importance of FHH for disease prevention. Such community-based approaches can help to close knowledge and skills gaps about FHH, and increase confidence in using this information to improve the health of those most at risk [39,40]. Future research focused on effective models of healthcare delivery is justified.

Study limitations

While our study findings highlighted the feasibility of using online tools to enhance learning about familial risks, limitations include the small sample size (~50% had at least 1 year of college education) and bias inherits in prepost study design in relation to the observed changes in knowledge and attitudes. A follow-up study that includes a larger and representative sample of the general population is justified. In addition, while this study assessed participants' reported plans for future behavioral changes, it did not elicit whether or not participants actually shared their FHH information with their family or healthcare

providers. In addition, our study did not assess the influence of the GRACE program on disease outcomes. Future research to integrate the GRACE-FHH project into clinical practice and include follow-up with outcome measures is underway.

Future perspective

The use of FHH is expected to expand from collecting short FHH questionnaires during patients' medical visits, to obtaining detailed FHH information that will allow for genetic risk assessment outside of the visit. Familial risks assessment is a valid and feasible method for many common chronic diseases. Using detailed FHH information is important for identifying individuals at risk for single-gene disorders (e.g., sickle cell disease) and common chronic conditions (e.g., diabetes) and their associated complications (e.g., diabetic nephropathy). It is a valuable tool at specialty care and primary outpatient practices, and such information is important for healthcare providers and for patients and their relatives regardless of their age, gender and ethnic origins.

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Executive summary

Aim

- To enhance learning, knowledge, attitudes and practices about the importance of family health history (FHH) information and familial risks assessment among individuals with increased risks for common chronic diseases using a multicomponent approach.

Findings

- No significant change (χ^2 test, $p > 0.05$) in participants' general knowledge about FHH (e.g., definitions of FHH). However, significant changes (χ^2 test, $p < 0.05$) in participants' specific knowledge about factors (e.g., having young and multiple affected relatives with the same conditions) that affect their familial risks were observed.
- Significant changes (χ^2 test, $p < 0.05$) in participants' attitudes toward familial risks assessment for common disease complications and confidence in controlling these risks have been documented.
- Participants' reported high level of satisfaction in using online FHH tools, yet no significant change (χ^2 test, $p > 0.05$) was detected in their reported practices regarding sharing FHH information with their providers or relatives.
- Focus group interviews conducted after the learning sessions revealed that participants were uncertain about providers' or relatives' reactions to sharing FHH information.

Conclusion

- Using different learning styles to reach a diverse audience may have a significant impact on improving specific knowledge and attitudes related to familial risks.
- Using online tools to collect FHH information outside of the patient visit is an acceptable and feasible approach.
- The GRACE program has the potential to enhance learning about FHH information and familial risks assessment among individuals with increased risks for common chronic diseases using a multicomponent approach.
- Improvement in learning about familial risks has important implications for common chronic disease prevention and early detection.

Table 1

Demographic characteristics.

Characteristic	Overall (n = 75)
Age, mean ± SD (years)	48.1 ± 13.3
Gender	
Male	16 (21)
Female	59 (79)
Ethnicity	
Non-Hispanic white	41 (55)
Hispanic or Latino	33 (44)
No response	1 (1)
Education	
Grades 1–8 or less (elementary)	2 (3)
Grades 9–11 (some high school)	8 (11)
Grade 12 (high school graduate)	15 (20)
College 1–3 years	24 (32)
College 4 years or more (college graduate)	25 (34)
Income	
Less than or equal to US$25,000	21 (28)
US$25,001–35,000	10 (14)
US$35,001–50,000	7 (10)
US$50,001–75,000	13 (17)
More than US$75,000	11 (15)
Do not wish to provide information	12 (16)
Access to computer with internet to complete SG-FHH tool	
Poor	4 (5)
Moderate	6 (8)
Excellent	64 (87)
Ability to use computer	
Poor	8 (11)
Moderate	7 (9)
Excellent	60 (80)

Mean ± SD and frequency (%) are indicated.

SD: Standard deviation; SG-FHH: Surgeon General Family Health History.

Table 2

Assessment of participants' knowledge regarding familial risks pre- and post-GRACE learning sessions (n = 75).

Knowledge items	Pre; n (%)	Post; n (%)	% change; p-value
FHH refers to diseases and conditions that run in my family			
Agree	72 (96)	72 (96)	0; 1.00
Disagree	3 (4)	3 (4)	
Knowing FHH will help in identifying risks for diseases			
Agree	70 (94)	75 (100)	6; 0.058
Disagree	5 (6)	0 (0.0)	
Having a FDR with a chronic disease can increase chances of developing that disease			
Agree	72 (96)	73 (97)	1; 1.00
Disagree	3 (4)	2 (3)	
Having multiple affected family members with the same or related conditions can increase chances of developing that disease			
Agree	52 (70)	64 (85)	15; 0.019
Disagree	23 (30)	11 (15)	
Having young affected family members with the same or related conditions can increase chances of developing that disease			
Agree	38 (51)	62 (82)	31; 0.001
Disagree	37 (49)	13 (18)	
Having multiple and young affected family members with the same or related conditions can increase chances of developing that disease			
Agree	15 (20)	38 (51)	31; 0.001
Disagree	60 (80)	37 (49)	

FDR: First-degree relative; FHH: Family health history.

Table 3

Assessment of participants' attitudes and practices regarding familial risks pre- and post-GRACE learning sessions (n = 75).

Attitudes and practices items	Pre; n (%)	Post; n (%)	% change; p-value
Worried about developing chronic diseases in the future due to FHH [†]			
Agree	60 (80)	59 (79)	1; 0.840
Disagree	15 (20)	16 (21)	
Worried about developing complications for conditions I already have due to FHH [†]			
Agree	40 (53)	54 (72)	19; 0.018
Disagree	35 (47)	21 (28)	
Feel that I have little control over risks to my health			
Agree	49 (65)	34 (45)	-20; 0.013
Disagree	26 (45)	41 (55)	
Discuss my FHH with my providers			
Agree	50 (66)	59 (78)	12; 0.090
Disagree	25 (34)	16 (22)	
Discuss my FHH with my relatives			
Agree	50 (67)	56 (74)	8; 0.281
Disagree	25 (33)	19 (26)	
Make lifestyle changes (e.g., diet) to minimize my risks of developing common chronic diseases or its complications			
Agree	50 (67)	56 (74)	8; 0.281
Disagree	25 (33)	19 (26)	

FHH: Family health history.

[†]Intended measures.

Table 4

Satisfaction in using the Surgeon General Family Health History online tool (n = 75).

Satisfaction	Frequency (%)
Definition of FHH categories in SG-FHH tool	
Poor	3 (4)
Moderate	8 (11)
Excellent	64 (85)
Ease of reading items in SG-FHH tool	
Poor	1 (1)
Moderate	4 (5)
Excellent	70 (94)
Relevance of FHH categories in SG-FHH tool to own family	
Poor	6 (8)
Moderate	17 (23)
Excellent	52 (69)
Ability to complete SG-FHH tool	
Poor	2 (3)
Moderate	6 (8)
Excellent	67 (89)
Usefulness of SG-FHH tool	
Poor	0 (0)
Moderate	3 (4)
Excellent	72 (96)
Likelihood to recommend SG-FHH tool	
Poor	2 (3)
Moderate	5 (7)
Excellent	68 (90)
Likelihood to recommend linking SG-FHH tool to personal health record	
Poor	2 (3)
Moderate	6 (8)
Excellent	67 (89)

FHH: Family health history; SG-FHH: Surgeon General Family Health History.