AN EVALUATION OF RUTGERS GENETIC COUNSELING CERTIFICATE PROGRAM

By

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Written under the direction of

Gary Heiman

And approved by

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ABSTRACT OF THE THESIS

An Evaluation of Rutgers Genetic Counseling Certificate Program

By ERIN MCGRAW

Thesis Director:
Gary Heiman

The demand for genetic counselors continues to grow as advancements are made in the field of genomics. Exposing undergraduate students to the genetic counseling profession may help fill this demand by generating interest in an expanding field and preparing students to apply to graduate-level programs. One such exposure that currently exists is the Genetic Counseling Certificate Program (GCCP) offered to undergraduate students at Rutgers University. To determine the effectiveness, benefits, and limitations of the GCCP, a program evaluation was conducted. Former GCCP students, along with the genetic counselors that supervised these students, were surveyed to assess how they perceived the program. Overall, students and supervisors enjoyed participating in the GCCP. Most students, including those that ultimately chose a different career path, thought the program successfully met its objectives and thought their participation in the GCCP was beneficial. All of the supervisors thought the amount of time they dedicated to supervising GCCP students was reasonable, while 80% said they would continue to work with these students in the future. In addition to surveying GCCP students and supervisors, program directors of genetic counseling graduate programs were also surveyed to investigate the amount of genetic counseling exposure offered to undergraduate students.
at their universities. Of those who had undergraduate students at their university, over 90% indicated one or more forms of genetic counseling exposure were offered. Despite the majority of program directors indicating this exposure was effective, 90% thought their program or department could be doing more to introduce undergraduates to the genetic counseling profession. Because the GCCP is viewed favorably by former students and supervisors, implementing something similar to the certificate program may be an option for those looking to offer additional opportunities to their undergraduates.
Acknowledgements

Thank you to my thesis committee, Gary Heiman, Jessica Rispoli Joines, and Michele Bruno Horner, and assistant program director, Christine Seymour, for your guidance throughout this process. Your continued help and support were so appreciated and made this thesis possible.
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Introduction

Both advancements in genetics and the continued integration of genomics into medicine have resulted in an increased need for genetics professionals, including genetic counselors (Gerard et al., 2018; Pan et al., 2016). Between 2019 and 2029, the genetic counseling profession is projected to grow by 21%, which is much faster than the average growth rate for all occupations (Bureau of Labor Statistics, 2020). Recently, in an effort to accommodate the need for more genetic counselors, genetic counseling graduate programs have started to accept more applicants (Gerard et al., 2018; Wiesman et al., 2016). Additionally, several new graduate programs have been opened (Gerard et al., 2018; Wiesman et al., 2016). Of the 51 programs currently offered in the United States, 18 (35.3%) were opened within the last four years (Accreditation Counsel for Genetic Counseling, 2021).

To apply to genetic counseling graduate programs, applicants must meet a variety of requirements. According to the Association of Genetic Counseling Program Directors (AGCPD), programs typically expect their applicants to have the following: undergraduate coursework in the sciences, acceptable GRE scores, letters of recommendation, advocacy experience working with individuals who are either in a crisis or have a genetic condition, and experience shadowing or interviewing a genetic counselor (Association of Genetic Counseling Program Directors, 2021). Before a student can consider applying to graduate programs, however, they must have a good understanding of the genetic counseling profession. Unfortunately, many undergraduate students are not all that familiar with the career. A recent study showed that, despite the fact over 75% of undergraduate students heard of genetic counseling, less than 10% said
they were very familiar with it. In fact, the majority of students reported that they were not familiar with it at all (Gerard et al., 2018).

Since genetic counseling is not well understood by most undergraduates, offering exposure to the career in the undergraduate setting can be useful and advantageous. Not only can it serve as a way to familiarize students with the profession, but it can also help generate interest in a growing field. Additionally, for those who have decided to pursue a career in genetic counseling, undergraduate exposure has specific benefits. For example, exposure increases student awareness of the application requirements that must be met prior to applying to genetic counseling graduate programs.

Beyond introducing students to the field and preparing them to apply to graduate-level programs, undergraduate exposure can increase interest from underrepresented populations. According to the National Society of Genetic Counselors’ (NSGC) 2020 professional status survey (PSS), 95% of respondents identified as female, and 90% identified as white (National Society of Genetic Counselors, 2020). Despite this lack of diversity, students from underrepresented populations are just as likely to consider a career in genetic counseling, if given exposure to the career (Oh & Lewis, 2005). Unfortunately, when compared to their counterparts, these students have less exposure to the field. One possible way to remedy this disparity is by increasing exposure at the undergraduate level. Data has suggested that exposing undergraduates to genetic counseling may improve minority students’ awareness of the career (Price et al., 2020). Therefore, another potential benefit of undergraduate exposure lies in its ability to expand the profession’s diversity and inclusivity.
Although undergraduate exposure can be useful, the type of exposure offered to students can greatly impact how beneficial it is. Types of exposure can range anywhere from mentioning genetic counseling in a biology class, to genetic counseling clubs, to more formalized offerings, like a genetic counseling minor.

One unique form of exposure being offered to undergraduate students is the Genetic Counseling Certificate Program (GCCP) at Rutgers University (Rutgers School of Arts and Sciences, 2020). The GCCP is a program offered through the Department of Genetics. It is intended for declared genetics majors who express an interest in becoming a genetic counselor. Students that are accepted into the GCCP are given an opportunity to explore the genetic counseling field prior to applying to graduate programs. They are required to complete courses that are relevant to the profession, as well as volunteer their time working with individuals in a crisis. Additionally, before graduating, participants must complete a semester-long clinical rotation, where they are given an opportunity to shadow practicing genetic counselors. Not only do students observe cases during these rotations, but they also become familiar with the day-to-day roles and responsibilities of a genetic counselor that extend beyond seeing patients. According to the objectives of the GCCP, by the time participants finish the program, they should understand the genetic counseling profession, understand the application requirements for graduate-level programs, have experience talking with people who are in a crisis, and have experience in a clinical genetics setting.

The GCCP has been offered to undergraduate students at Rutgers for ten years. Despite the fact that it has existed for a decade, a formal evaluation to determine effectiveness, overall satisfaction from stakeholders, and perceived areas of improvement
has not been performed. Therefore, the purpose of this study was to conduct an educational program evaluation of the GCCP. This evaluation was performed by assessing how the program was perceived by former GCCP students as well as the genetic counselors that supervised these students during their clinical rotations.

In addition to evaluating the GCCP, this study also explored the amount and types of genetic counseling exposures offered to undergraduate students at other universities. Specifically, it investigated the different types of exposure offered by schools that had a genetic counseling graduate program at their institution. Since these institutions have a genetic counseling graduate program, they would be expected to provide more undergraduate exposures than institutions without a graduate program. Therefore, assessing whether or not additional exposure could be offered by these institutions had the potential to provide the most insight.
Methods

Participants

Participants of this study fell into one of three categories: former GCCP students, GCCP supervisors, or program directors of genetic counseling graduate programs.

*Former GCCP Students*

The GCCP was not officially approved by Rutgers School of Arts and Sciences until 2011. Prior to its approval, six students completed all or most of the GCCP’s requirements as part of an independent study. Because they completed all or most of the requirements, they were eligible to partake in this study. In addition to these six students, 28 students completed the certificate program following its 2011 approval. Therefore, they were also eligible participants.

Of the 34 former GCCP students, 17 (50%) were from an underrepresented population in the genetic counseling field. Overall, 27 of the 34 (79.4%) applied to genetic counseling graduate programs, and, of these 27, 26 (96.3%) were accepted. Of the remaining seven students, six decided to pursue a different career. The final student was lost to follow-up, and it was unknown if they applied to genetic counseling graduate programs.

*GCCP Supervisors*

Since the certificate program’s start, 26 genetic counselors have supervised GCCP students during their semester-long clinical rotation. Four of these counselors were former GCCP students as undergraduates. All 26 supervisors, whether they were actively
participating in the GCCP or had participated in the past, were eligible to partake in this program evaluation. Some of these counselors were Rutgers employees while others were not.

*Program Directors*

Currently, there are 51 genetic counseling graduate programs in the United States. When this study was conducted, approximately 50 programs were accredited through the Accreditation Council for Genetic Counseling. All program directors of accredited genetic counseling programs (approximately 50) were eligible to participate in this study.

*Surveys*

Three different surveys were developed for this program evaluation. Each contained closed-ended, open-ended, and check-all-that-apply questions. Additionally, two of the three surveys asked respondents to rate statements on a Likert scale. The number of questions each participant received varied based on how they responded to the survey (i.e., skip-outs).

The purpose of the first survey (Survey #1) was to assess former GCCP students’ thoughts on the certificate program’s objectives, strengths, and weaknesses. Additionally, it assessed how participation in the program affected students’ future career decisions. The purpose of the second survey (Survey #2) was to determine how GCCP supervisors viewed their certificate program experience with respect to overall involvement and time commitment. Finally, the purpose of the third survey (Survey #3) was to investigate the amount and type of genetic counseling exposure offered to undergraduate students at
institutions with a genetic counseling graduate program. It evaluated how the genetic counseling program directors at these institutions viewed the undergraduate exposure offered at their university.

Survey Distribution

All three surveys were created in Qualtrics. Former GCCP students and GCCP supervisors were contacted directly via email to ask for their participation in this program evaluation. The email containing the link to Survey #3 was sent to program directors of genetic counseling graduate programs via the AGCPD listserv. All three emails were initially sent out on December 18, 2020. Reminder emails were sent for Survey #1 and Survey #2 on January 4, 2021.

Data from each survey was stored in Qualtrics, which could only be accessed through a Rutgers-affiliated, password protected account. All collected survey responses were anonymous. This study was approved by the Rutgers University Institutional Review Board.

Data Analysis

Closed-ended and check-all-that apply questions were analyzed by calculating the percentage of participants that chose each response. Similarly, questions involving a Likert scale were analyzed by calculating the percentage of participants that chose each of the following: strongly agree, agree, neutral, disagree, and strongly disagree. Responses to open-ended questions were reviewed for similar themes and grouped. After grouping responses, the prevalence of each theme was calculated using percentages.
Results

FORMER GCCP STUDENTS (Survey # 1)

Of the 34 GCCP students eligible to participate in this study, valid emails were available for 33. Twenty-three students completed the survey for a response rate of 69.7%. Of the 23 respondents, 47.8% reported that they were part of an underrepresented population in the genetic counseling field (e.g., Hispanic, LGBTQ, male). Comparatively, of all 34 students eligible to participate in this study, 17 (50%) were part of an underrepresented population in the genetic counseling field.

Ten respondents (43.5%) reported that they completed their undergraduate degree within the last five years, while the remaining respondents (56.5%) received their undergraduate degree greater than five years ago.

There were three types of former GCCP students: 1) those that applied to genetic counseling graduate programs and were accepted (henceforth called “accepted students”), 2) those that applied to genetic counseling graduate programs and were not accepted (henceforth called “not-accepted students”), and 3) those that did not apply to a genetic counseling master’s program (henceforth called “alternative students”). Of the 23 respondents, 18 (78.3%) were accepted students, one (4.3%) was a not-accepted student, and four (17.4%) were alternative students. In comparison, of the 34 total students eligible, 26 (76.5%) were accepted students, one (2.9%) was a not-accepted student, and six (17.6%) were alternative students. The career path of one student (2.9%) was unknown due to loss to follow-up.
Meeting the GCCP Objectives

Overall, former GCCP students indicated that the certificate program was successful at meeting its objectives (Table 1a). The majority of accepted and alternative students either strongly agreed or agreed that all four objectives were met. The one not-accepted student strongly agreed that three of the four objectives were met but indicated “neutral” when asked if the GCCP ensured they had a good understanding of the prerequisites needed to apply to genetic counseling graduate programs.

Overall Impression of the GCCP

Over 90% of former certificate students said they would recommend the GCCP to undergraduate students interested in genetic counseling, the amount of time they committed to the program was appropriate, and their participation in the GCCP was a positive experience (Table 1b). Slightly less than 70% indicated their participation in the certificate program impacted their decision to apply to genetic counseling graduate programs.

When students were asked what the most beneficial aspect of the program was, the clinical rotation was the most common theme. Of the 17 participants that answered this question, 14 (82.4%) included this theme in their response. The second most common theme was that participating in the GCCP aided with the application process by assuring the proper prerequisites had been completed and/or by prepping students for interviews. Four participants (23.5%) included this theme in their response.

Students were also asked how the GCCP could be improved. Although there was a wide range of responses, two common themes appeared in participants’ answers. Of the
14 students that answered this question, three (21.4%) indicated the GCCP should better educate its students about non-traditional roles in genetic counseling. Additionally, three participants (21.4%) thought it was challenging to find a volunteer opportunity that allowed them to work with individuals in a crisis. Therefore, they suggested that the GCCP should help students find this opportunity.
Table 1a
Former GCCP students’ assessment of how well the certificate program met its objectives

<table>
<thead>
<tr>
<th></th>
<th>Accepted Students (n=18)</th>
<th>Not-Accepted Students (n=1)</th>
<th>Alternative Students (n=4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The program enhanced my understanding of the genetic counseling profession.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>17 (94.4)</td>
<td>1 (100)</td>
<td>3 (75.0)</td>
</tr>
<tr>
<td>Agree</td>
<td>1 (5.6)</td>
<td>0</td>
<td>1 (25.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Disagree/Strongly Disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>I gained experience talking to individuals who were in a crisis.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>9 (50.0)</td>
<td>1 (100)</td>
<td>1 (25.0)</td>
</tr>
<tr>
<td>Agree</td>
<td>6 (33.3)</td>
<td>0</td>
<td>2 (50.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>3 (16.7)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0</td>
<td>0</td>
<td>1 (25.0)</td>
</tr>
<tr>
<td><strong>After completing the program, I had a good understanding of the requirements that needed to be met to apply to genetic counseling graduate programs.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>14 (77.8)</td>
<td>0</td>
<td>2 (50.0)</td>
</tr>
<tr>
<td>Agree</td>
<td>4 (22.2)</td>
<td>0</td>
<td>2 (50.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td>1 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Disagree/Strongly Disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>I gained genetic counseling experience in a clinical setting.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>17 (94.4)</td>
<td>1 (100)</td>
<td>3 (75.0)</td>
</tr>
<tr>
<td>Agree</td>
<td>1 (5.6)</td>
<td>0</td>
<td>1 (25.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Disagree/Strongly Disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 1b
Former GCCP students’ overall impressions of the certificate program

<table>
<thead>
<tr>
<th></th>
<th>Accepted Students (n=18) # (%)</th>
<th>Not-Accepted Students (n=1) # (%)</th>
<th>Alternative Students (n=4) # (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would recommend this program to undergraduate students interested in pursuing a career in genetic counseling.</td>
<td>15 (83.3) 0</td>
<td>3 (75.0)</td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>14 (77.8) 0</td>
<td>3 (75.0)</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>3 (16.7) 1 (100)</td>
<td>1 (25.0)</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>1 (5.6) 0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Disagree/Strongly Disagree</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>The amount of time I was required to commit to this program was appropriate.</td>
<td>10 (55.6) 0</td>
<td>2 (50.0)</td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>10 (55.6) 0</td>
<td>2 (50.0)</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>2 (11.1) 0</td>
<td>2 (50.0)</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>2 (11.1) 1 (100)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>1 (5.6) 0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>3 (16.7) 0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>My decision to apply/not apply to genetic counseling graduate programs was impacted by my participation in the certificate program.</td>
<td>13 (72.2) 1 (100)</td>
<td>3 (75.0)</td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>13 (72.2) 1 (100)</td>
<td>3 (75.0)</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>3 (16.7) 0</td>
<td>1 (25.0)</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>2 (11.1) 0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Overall, I would consider my participation in the certificate program a positive experience.</td>
<td>12 (66.7) 1 (100)</td>
<td>3 (75.0)</td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>12 (66.7) 1 (100)</td>
<td>3 (75.0)</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>3 (16.7) 0</td>
<td>1 (25.0)</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>2 (11.1) 0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Accepted GCCP Students

Of the 18 accepted, 16 (88.9%) applied once prior to their acceptance, while the remaining two students (11.1%) applied twice before being accepted. Seventeen participants (94.4%) applied to graduate programs as a senior in college, and one (5.6%) applied after taking a gap year. When asked if participating in the GCCP impacted when they chose to apply, 11 (61.1%) students responded yes. Of these 11, seven (63.6%) indicated the GCCP prepared them to apply and enter graduate school, which is why they thought participating in the program impacted when they applied.

Seventeen students (94.4%) thought participating in the program was advantageous to them during their time as a graduate student. Of these 17 students, over 70% said the program provided them with a good baseline understanding of the genetic counseling field, familiarized them with some of the basic skills genetic counselors regularly use (ex. taking a family history), and/or exposed them to counseling techniques that could be applied to the genetic counseling profession. All 18 students said that, as practicing genetic counselors, they would be willing to work with students participating in the GCCP or something similar.

Not-Accepted and Alternative GCCP Students

The not-accepted student applied to master’s programs twice before deciding not to apply again. This student began applying as a senior in college and did not feel participating in the GCCP impacted when they chose to apply.

Half (2/4) of the alternative students said they would have applied to genetic counseling graduate programs had they not participated in the GCCP. Although they
decided not to apply, all four respondents believed the certificate program influenced the
career path they chose to pursue.

**GCCP SUPERVISORS (Survey #2)**

Of the 26 supervisors eligible to participate in this survey, valid emails were
available for 21 of them. Of the 21, 10 (47.6%) completed the survey. Partial responses
were not included.

The number of GCCP students genetic counselors supervised ranged from one to
five or more. All 10 supervisors liked the structure of the GCCP, and eight (80%) of the
respondents thought the length of the clinical rotation was appropriate. Of the remaining
two supervisors, one (10%) believed the rotation length was too short, while the other
(10%) thought it was too long. All of the GCCP supervisors indicated the amount of time
they dedicated to supervising the GCCP students was reasonable. Eighty percent of
respondents said nothing would prevent them from working with GCCP students in the
future. The remaining 20% stated that supervising genetic counseling graduate students
would limit their availability.

Overall, 90% of respondents described their experience working with GCCP
students as positive. The remaining 10% indicated “neutral” when asked about their
experience.

**PROGRAM DIRECTORS (Survey #3)**

Approximately 50 program directors were eligible to participate in this study.
Seventeen completed it for a response rate of 34%. Partial responses were not included.
Eleven program directors (64.7%) indicated undergraduate students attended their university, while the remaining six (35.3%) said there were no undergraduates at their institution.

Program Directors with Undergraduate Students at their University

Of the 11 program directors that had undergraduates at their institution, six (54.5%) indicated that their genetic counseling graduate program and undergraduate science programs were in close proximity to one another but not on the same campus. Of the remaining participants, four (36.4%) stated that their genetic counseling graduate program and undergraduate science programs were located on the same campus. One respondent (9.1%) said that the undergraduate science programs offered at their institution were located on multiple campuses. Therefore, they reported that their genetic counseling graduate program only shared a campus with some of their science programs.

Nine of the 11 (81.8%) program directors stated their graduate program had minimal interaction with the undergraduate students at their university. One respondent (9.1%) described the amount of interaction as moderate, while the final respondent (9.1%) described the amount of interaction as considerable. Regardless of the amount of interaction they had, respondents were asked about the type of genetic counseling exposure offered to the undergraduates at their institution (Table 2). All but one participant (90.9%) said their university offered one or more forms of exposure.
Table 2
Program directors’ responses when asked to select which of the following exposures were offered by their university

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Program Directors (n=11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A genetic counseling minor/genetic counseling certificate program</td>
<td>1 (9.1)</td>
</tr>
<tr>
<td>A full course on genetic counseling</td>
<td>2 (18.2)</td>
</tr>
<tr>
<td>Science courses that include a lecture(s) about genetic counseling</td>
<td>9 (81.8)</td>
</tr>
<tr>
<td>A genetic counseling club</td>
<td>6 (54.5)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Meet and greets with the graduate program</td>
<td>2 (18.2)</td>
</tr>
<tr>
<td>GCA position</td>
<td>1 (9.1)</td>
</tr>
<tr>
<td>Unsure</td>
<td>0 (0)</td>
</tr>
<tr>
<td>None of the above</td>
<td>1 (9.1)</td>
</tr>
</tbody>
</table>

Program Directors with Undergraduate Students and Genetic Counseling Exposure

The 10 program directors whose university offered undergraduate exposure were asked how they perceived that exposure (Figure 1). The majority of program directors strongly agreed or agreed that the exposure offered by their institution effectively introduced undergraduate students to the genetic counseling field and effectively recruited them to apply to genetic counseling master’s programs. When asked about incorporating additional exposure, 90% of program directors stated that their program or department could be doing more to expose undergraduate students to the genetic counseling profession.
Figure 1: Program directors’ assessment of the effectiveness of the undergraduate genetic counseling exposure offered by their university

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate exposure is effective at introducing students to field</td>
<td>3</td>
<td>1</td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Undergraduate exposure is effective at recruiting students to apply to master’s program</td>
<td>2</td>
<td>2</td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

The GCCP is a unique form of undergraduate genetic counseling exposure that familiarizes students with the profession and prepares them to apply to graduate-level programs. By surveying former GCCP students and GCCP supervisors, the effectiveness, strengths, and weaknesses of the certificate program were evaluated. Overwhelmingly, former students thought the GCCP met its four objectives and indicated that they viewed the program favorably. In addition to students viewing the program favorably, GCCP supervisors also enjoyed participating in the certificate program and having the opportunity to engage with undergraduates. Beyond conducting a program evaluation of the GCCP, this study also assessed the types of undergraduate exposure offered by universities with genetic counseling graduate programs. Although most program directors with undergraduates at their university indicated some form of exposure was offered at their institution, the majority thought their program or department could be doing more to introduce undergraduates to the genetic counseling field.

While the GCCP was viewed favorably for a number of reasons, one component that makes this program stand out is its ability to provide participants with a semester-long clinical rotation. When asked to elaborate on the most beneficial aspect of the certificate program, one student said:

The GCCP rotation gave me the closest possible experience to working as a genetic counselor. It helped me to feel familiar and comfortable with the scope of work that a genetic counselor does, to understand how genetic counselors interact with their colleagues, to see what goes on behind-the-scenes in between patient visits, and to get a sense of what a “typical day” really looks like. I found tremendous value in being able to follow patients through multiple stages in their journey. In addition, I enjoyed seeing how each genetic counselor responded to patients and how their counseling style and strategy changed depending on the person and their needs. Lunchtime conversations with the genetic counselors were opportunities to ask questions about any and all aspects of the career and its ups and downs. I would never have had this
insider's view of a genetic counseling career without the GCCP!

Similar thoughts and sentiments were expressed in many of the students’ responses. For example, another participant stated:

I think the most beneficial aspect of the program is the opportunity for shadowing. In both my personal experience and discussions with classmates in my mater’s [sic] program it was clear this was the hardest experience to find when learning about genetic counseling. In my shadowing I got to see several cases that gave me a stronger understanding of what it means to be a genetic counselor, including the prep and post visit work involved in the process.

Responses such as these demonstrate the usefulness of facilitating shadowing opportunities for undergraduate students. Former GCCP students indicated that the semester-long clinical rotation was advantageous to participants. Not only does it provide them with a considerable amount of exposure to genetic counseling in a clinical setting, but it also gives them an opportunity to follow up with patient cases. Additionally, the length of the rotation has allowed GCCP students to become more familiar with the various responsibilities of a genetic counselor. Considering many undergraduate students may face challenges securing shadowing opportunities on their own (limited counselor availability, few counselors in geographic area, etc.), the GCCP’s ability to provide a rotation for its students is invaluable, especially because studies have shown students find hands-on-opportunities most helpful when learning about new careers (Gerard et al., 2018).

In addition to the clinical rotation, another of the GCCP’s strengths lies in its ability to aid students with future career decisions. Of the 23 students that participated in this evaluation, only four (17.4%) indicated that GCCP participation did not help them decide whether or not they wanted to apply to genetic counseling graduate programs. Because all four of these respondents were accepted students, it is likely that, prior to
participating in the certificate program, they were already certain they wanted to pursue a
career in genetic counseling. Although GCCP participation may not have influenced
these students’ future career decisions, it was advantageous to them in other ways. For
example, all accepted students, including the four mentioned above, thought the
certificate program familiarized them with genetic counseling graduate programs’
application requirements. Therefore, participating in the GCCP prepared these students to
apply to graduate-level programs.

While GCCP participation did not influence career decisions for some students,
the majority of former GCCP students indicated that participating in the certificate
program helped them decide if they wanted to apply to genetic counseling graduate
programs. In fact, half of the alternative students (those that decided on a different career)
said they would have applied had they not participated in the GCCP. Therefore, because
the exposure the certificate program offers provides students with a better understanding
of the profession, it can prevent some from pursuing a career that is not a good fit.
Additionally, if a student has completed such a program, admissions committees of
graduate programs will know that applicants have a more complete understanding of the
profession.

When it comes to future career decisions, results from this study suggest the
GCCP does more than ensure individuals are actually interested in the genetic counseling
profession. For example, all of the alternative students said the career path they ended up
choosing was influenced by their GCCP participation. Therefore, because it helped them
identify a career they were truly passionate about, participating in the GCCP still proved
to be advantageous for them.
Another important aspect of the GCCP is that it has exposed students from a diverse background to the career. Of the 34 students eligible to participate in this program evaluation, 17 (50%) were part of an underrepresented population in the genetic counseling field. This proportion differs from the demographics of practicing genetic counselors, considering NSGC’s 2020 PSS revealed 90% of counselors identified as white, and 95% identified as female (National Society of Genetic Counselors, 2020). While only a small number of students have participated in the GCCP, the current assessment of its demographics suggest it has successfully exposed and introduced underrepresented populations to a field that lacks diversity.

While the GCCP has many strengths, former students did suggest improvements. One such improvement was to better educate students about the non-traditional roles available to genetic counselors. Although the majority of practicing genetic counselors (52%) have more traditional, direct patient care positions, non-traditional roles are becoming more prevalent (National Society of Genetic Counselors, 2020). According to NSGC’s PSS, 25% of counselors reported they had non-direct patient care positions, while 23% reported having mixed direct and non-direct patient care positions (National Society of Genetic Counselors, 2020). Because these non-traditional roles are becoming more plentiful and popular, exposing students to them can assure they have a more comprehensive understanding of the genetic counseling profession. The certificate program may be able to facilitate this exposure by providing this feedback to GCCP supervisors. If supervisors are aware that students would like to learn more about non-traditional genetic counseling roles, they can have discussions with them surrounding the
interactions they have with genetic counselors in various settings (laboratory, pharmaceuticals, etc.).

Overall, former GCCP students described their participation in the certificate program as positive. Although they viewed the program favorably, assessing the views of GCCP supervisors was crucial as well. The GCCP’s clinical rotation is one of its greatest attributes. Therefore, when it comes to the certificate program, the opinions of GCCP supervisors are just as important as the students’. When asked about their experience working with certificate students, nearly every supervisor indicated it was positive. Elaborating on this further, one supervisor said:

The students I have worked with have been highly engaged and competent. I had the impression that their GCCP clinical rotation was a highlight of their week and something that they looked forward to. It has been enjoyable for me to work with these students, and quite rewarding to see them go on to become genetic counselors!

Because the success of the GCCP ultimately relies on the willingness of genetic counselors to participate, it is promising that GCCP supervisors seem to enjoy working with certificate students. So long as they enjoy the experience, one would expect one of the most crucial aspects of the GCCP to remain intact.

Although a positive experience is important, time commitment is another factor that must be considered in regard to the GCCP supervisors. They can only continue participating in the program if they have the availability to do so. Fortunately, time did not seem to be a limiting factor for most supervisors. In fact, all supervisors thought the amount of time they dedicated to supervising students was reasonable. Furthermore, most of them indicated that the length of the GCCP’s rotation was appropriate and said nothing would prevent them from working with certificate students in the future. This is once
again promising. Not only do GCCP supervisors enjoy working with students, but they appear to view the time commitment as feasible.

Evaluating the GCCP has shown that it is both beneficial and possible to offer a considerable amount of genetic counseling exposure to undergraduate students. Although undergraduate exposure is offered to students at other institutions, most of this exposure does not seem comparable to the GCCP. The majority of genetic counseling program directors with undergraduate students at their university indicated that their institution offered one or more types of exposure. However, this exposure often came in the form of sciences courses that included a lecture(s) about genetic counseling or a genetic counseling club. While many program directors indicated these types of exposures effectively introduced students to the genetic counseling field and recruited them to apply to master’s programs, they still thought their program or department could be doing more.

Because students find it valuable and supervisors enjoy participating, implementing something similar to the GCCP could be an option for those looking to add to the amount of exposure offered to undergraduate students. The GCCP has benefits beyond those that can be found in a science course, genetic counseling club, etc., and creating more programs like it could enhance undergraduates’ knowledge of the genetic counseling profession. That being said, it is important to acknowledge that barriers may be present when trying to start a program like this. Although this study did not specifically assess potential barriers to creating programs similar to the GCCP, one would anticipate time commitment, number of genetic counselors in the geographic location, little interaction with undergraduate students, etc. to play a role. If these barriers can be
overcome, however, implementing programs like the GCCP could provide undergraduate students with a great opportunity.
Limitations

Because so few students and supervisors completed and/or participated in the certificate program, only a small number of individuals were eligible to participate in Survey #1 and Survey #2. Therefore, even though the response rates of both surveys approached 50% or above, the actual number of students/supervisors that completed the two surveys was small. The significance of the responses to these surveys must be taken into context with the small sample size.

Although the results of this evaluation suggest GCCP supervisors view the certificate program favorably, there was possible ascertainment bias. Supervisors who enjoyed participating in the GCCP may have been more likely to complete the survey. In contrast, supervisors who were no longer actively participating in the certificate program may have been less likely to complete the survey. Therefore, the majority of supervisors that responded to Survey #2 may have had a positive experience and/or may have been currently involved with the GCCP.

Institutions with genetic counseling graduate programs were expected to provide more exposure to undergraduate students than institutions without graduate programs. Therefore, this study only assessed the amount and types of undergraduate genetic counseling exposure offered by a select number of universities. Results from this survey cannot be generalized to universities without graduate programs in genetic counseling.

This evaluation did not ask program directors to indicate how long their genetic counseling graduate program has been in existence. Approximately 35% of the directors eligible to partake in this study were leaders of newer programs. If these directors participated in the study, they were unable to explain how the age of their program
impacted their ability to aid with the implementation of additional exposures. Therefore, even if program directors indicated their program or department could be doing more to expose undergraduates to the genetic counseling profession, it does not mean they do not have plans to do so.

Finally, program directors were invited to participate in this study via an email sent through the AGCPD listserv. Although this email was intended for program directors, other individuals, such as assistant program directors, also received it. While the email clearly stated program directors were eligible to participate in this evaluation, it is possible other individuals completed it as well. It is even possible the survey was completed by multiple individuals from the same university. If this occurred, it would mean the same data was collected more than once.
Conclusion and Future Directions

The GCCP is a unique form of undergraduate genetic counseling exposure that is advantageous for a number of reasons, ranging from its ability to familiarize students with the profession to its effectiveness at introducing underrepresented populations to the field. Although the program has many strengths, such as its semester-long clinical rotation, it can be improved. Moving forward, the GCCP should aim to better educate its students about the non-traditional roles available to genetic counselors. Asking supervisors to talk with students about their interactions with genetic counselors in non-direct patient care positions may be a step in the right direction.

While improvements can be made, overall, both students and supervisors enjoy participating in the GCCP. Therefore, implementing something similar to the certificate program may be an option for universities looking to add to the amount of genetic counseling exposure offered to their undergraduate students. However, because barriers may be present when trying to create programs like the GCCP, future studies should investigate the challenges universities may face when trying to implement additional exposures and explore ways these challenges can be overcome.
References


Appendix A

Survey #1

1.) Do you consider yourself part of an underrepresented population in the genetic counseling field (ex. Hispanic, LGBTQ, male, etc.)?
   a. Yes
   b. No

2.) How long has it been since your undergraduate graduation?
   a. 0 – 5 years
   b. Greater than 5 years

3.) The following are the main objectives of the Genetic Counseling Certificate Program (GCCP). Please indicate how successful the program was at meeting these objectives by rating each on a scale of 1 - 5 (1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5 – strongly agree).
   a. The program enhanced my understanding of the genetic counseling profession.
   b. I gained experience talking to individuals who were in a crisis.
   c. After completing the program, I had a good understanding of the requirements that needed to be met to apply to genetic counseling graduate programs.
   d. I gained genetic counseling experience in a clinical setting.

4.) Add any comments that are relevant to the main objectives of the GCCP.

5.) Rate the following on a scale from 1 – 5 (1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5 – strongly agree).
a. I would recommend this program to undergraduate students interested in pursuing a career in genetic counseling.

b. The amount of time I was required to commit to this program was appropriate.

c. My decision to apply/not apply to genetic counseling graduate programs was impacted by my participation in the certificate program.

d. Overall, I would consider my participation in the certificate program a positive experience.

6.) What was the most beneficial aspect of the program?

7.) What improvements would you suggest?

8.) Please chose one of the following:

   a. I chose to apply and was accepted into a genetic counseling master’s program.

   b. I chose to apply and was not accepted into a genetic counseling master’s program.

   c. I did not apply to a genetic counseling master’s program.

For those who chose to apply and were accepted to a genetic counseling master’s program:

9.) Did participating in the certificate program effectively prepare you for the application process?

   a. Yes

   b. No

10.) For those who answered yes to #9, how did the certificate program prepare you
for the application process? Please check all that apply.

a. The program ensured that I had completed the pre-requisite courses required by masters-level programs.

b. The clinical rotation I was required to complete gave me a better understanding of the genetic counseling profession, which I was able to discuss in my application/during my interview.

c. I was able to talk about counseling experience in my application/interview because the GCCP required me to volunteer at a crisis hotline or something similar.

d. I was given the opportunity to refine my interview skills in mock interviews.

e. Other
   i. Please specify

11.) When did you first apply to graduate schools?

   a. As a senior in college
   b. After taking a gap year
   c. Other
      i. Please specify

12.) Did your participation in this program impact when you decided to apply?

   a. Yes
   b. No

13.) For those who answered yes to #12, please explain how your participation in the program impacted when you decided to apply.
14.) How many times did you apply prior to your acceptance?
   a. 1
   b. 2
   c. 3+

15.) Did you feel participating in the certificate program was advantageous during your time as a graduate student?
   a. Yes
   b. No

16.) For those who answered yes to #15, why was your participation in the GCCP advantageous during your time as a graduate student? Please check all that apply.
   a. My participation in the GCCP provided me with a good baseline understanding of the genetic counseling profession.
   b. Having the opportunity to rotate with genetic counselors for a semester familiarized me with some of the basic skills counselors regularly use (ex. taking a family history).
   c. The required crisis volunteering experience taught me counseling techniques that could be applied to the genetic counseling profession.
   d. Other
      i. Please specify

17.) If given the opportunity, as a practicing genetic counselor, would you choose to work with students participating in the certificate program or something similar?
   a. Yes
   b. No
For those who chose to apply and were not accepted to a genetic counseling master’s program:

9.) When did you first apply to graduate schools?
   a. As a senior in college
   b. After taking a gap year
   c. Other
      i. Please specify

10.) Did your participation in this program impact when you decided to apply?
   a. Yes
   b. No

11.) For those who answered yes to #10, please explain how your participation in the program impacted when you decided to apply.

12.) How many times did you apply?
   a. 1
   b. 2
   c. 3+

13.) Do you plan on applying again?
   a. Yes
   b. No

14.) If you reapplied or are planning to reapply, did participating in the certificate program impact this decision?
   a. Yes
   b. No
c. Not applicable

For those who chose not to apply to a genetic counseling master’s program

9.) Do you think you would have applied had you not participated in the certificate program?
   a. Yes
   b. No

10.) Which career path did you decide to pursue?

11.) Did participating in the certificate program influence the career path you chose to pursue?
   a. Yes
   b. No

12.) For those who answered yes to #11, how did participating in the GCCP influence the career path you chose to pursue?

Survey #2

1.) Approximately how many certificate students have you supervised?
   a. 1
   b. 2-4
   c. 5 or greater

2.) At the beginning of their rotation, the certificate students’ understanding of the genetic counseling profession was _____________ the understanding of undergraduate students who were not part of the Genetic Counseling Certificate Program (GCCP).
   a. Better than
b. Similar to

c. Worse than

3.) Do you like the structure of the GCCP?

a. Yes
b. No

4.) I would describe the length of the rotation as:

a. Appropriate
b. Too short
c. Too long

5.) The amount of time I dedicated to supervising certificate students was:

a. Reasonable
b. Burdensome

6.) In the future, would anything prevent you from continuing to work with certificate students?

a. Yes
b. No

7.) For those who answered yes to #6, what would limit your availability? Please check all that apply.

a. Supervising genetic counseling graduate students
b. Supervising medical students
c. Other commitments
   i. Please specify
8.) Has participating in the certificate program improved future interactions with the students that have rotated with you (writing recommendation letters, hiring, etc.)?
   a. Yes
   b. No

9.) Have genetic counseling program directors ever contacted you about former GCCP students?
   a. Yes
   b. No

10.) For those who answered yes to #9, was your response positively affected by the students’ participation in the certificate program?
   a. Yes
   b. No

11.) Overall, I would describe my experience working with students from the GCCP as:
   a. Positive
   b. Negative
   c. Neutral

12.) What do you perceive to be beneficial about the certificate program? Please check all that apply.
   a. It exposes undergraduate students to the genetic counseling profession.
   b. It helps prepare students to apply to genetic counseling graduate programs.
   c. By teaching them more about the genetic counseling profession, it helps to ensure that those who apply to graduate programs are genuinely interested
in genetic counseling as a career.

d. Other

i. Please specify

13.) Are there any additional comments you would like to make about your experience working with the GCCP?

Survey #3

1.) Do you have undergraduate students at your institution?

a. Yes

b. No

For those that have undergraduate students at their institution:

2.) Pick the statement that best describes your institution.

a. Our genetic counseling graduate program and undergraduate science programs are located on the same campus.

b. Our genetic counseling graduate program and undergraduate science programs are in close proximity to one another but are not on the same campus.

c. Our genetic counseling graduate program and undergraduate science programs are not in close proximity to one another.

d. Other

i. Please specify

3.) I would describe the amount of interaction our graduate program has with undergraduate students as:
a. Considerable
b. Moderate
c. Minimal

4.) Of the following, what is offered at your university? Please check all that apply.
   a. A genetic counseling minor/genetic counseling certificate program
   b. A full course on genetic counseling
   c. A science course that includes a lecture(s) about genetic counseling
   d. A genetic counseling club
   e. Other
      i. Please specify
   f. Unsure
   g. None of the above

*For those that answered a-e to question #4:*

5.) Rate the following on a scale from 1 – 5 (1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5 – strongly agree).
   a. The undergraduate exposure offered at my institution is effective at introducing students to the genetic counseling field.
   b. The undergraduate exposure offered at my institution is effective at recruiting students to apply to genetic counseling master’s programs.

6.) What are the benefits of the undergraduate exposure offered at your university? Please check all that apply.
   a. It introduces undergraduate students to the genetic counseling profession.
   b. It helps prepare students to apply to genetic counseling graduate programs.
c. It strengthens students’ applications to genetic counseling graduate programs.

d. By teaching them more about the genetic counseling profession, it helps to ensure that those who apply to graduate programs are genuinely interested in genetic counseling as a career.

e. Other
   i. Please specify

7.) Do you think there is more that your program or department could be doing to expose undergraduate students to the genetic counseling profession?
   a. Yes
   b. No

8.) What additional exposures would you like to see at your university? Please check all that apply.
   a. A genetic counseling minor/genetic counseling certificate program
   b. A full course on genetic counseling
   c. A science course that includes a lecture(s) about genetic counseling
   d. A genetic counseling club
   e. Other
      i. Please specify
   f. None

For those that answered f to question #4:

5.) Please explain why you are unsure if your university offers undergraduate exposure to the genetic counseling profession.
6.) What do you think are the benefits of undergraduate genetic counseling exposure? Please check all that apply.
   a. It introduces undergraduate students to the genetic counseling profession.
   b. It helps prepare students to apply to genetic counseling graduate programs.
   c. It strengthens students’ applications to genetic counseling graduate programs.
   d. By teaching them more about the genetic counseling profession, it helps to ensure that those who apply to graduate programs are genuinely interested in genetic counseling as a career.
   e. Other
      i. Please specify

7.) What exposures would you like to see at your university? Please check all that apply.
   a. A genetic counseling minor/genetic counseling certificate program
   b. A full course on genetic counseling
   c. A science course that includes a lecture(s) about genetic counseling
   d. A genetic counseling club
   e. Other
      i. Please specify
   f. None

_For those that answered g to question #4:_

5.) To your knowledge, has your university ever tried to implement any type of undergraduate genetic counseling exposure?
a. Yes

b. No

For those who answered yes to question #5:

6.) What exposures has your university tried to implement? Please check all that apply.

   a. A genetic counseling minor/genetic counseling certificate program
   b. A full course on genetic counseling
   c. A science course that includes a lecture(s) about genetic counseling
   d. A genetic counseling club
   e. Other
      i. Please specify

7.) Why is the exposure currently not offered? Please check all that apply.

   a. Not enough interest from undergraduate students
   b. No longer have access to the resources needed to provide the exposure
   c. It was too time consuming
   d. Little interaction with undergraduate students
   e. Other
      i. Please specify

8.) What do you think are the benefits of undergraduate genetic counseling exposure?

   Please check all that apply.

   a. It introduces undergraduate students to the genetic counseling profession.
   b. It helps prepare students to apply to genetic counseling graduate programs.
c. It strengthens students’ applications to genetic counseling graduate programs.

d. By teaching them more about the genetic counseling profession, it helps to ensure that those who apply to graduate programs are genuinely interested in genetic counseling as a career.

e. Other

i. Please specify

9.) What exposures would you like to see at your university? Please check all that apply.

a. A genetic counseling minor/genetic counseling certificate program

b. A full course on genetic counseling

c. A science course that includes a lecture(s) about genetic counseling

d. A genetic counseling club

e. Other

i. Please specify

f. None

For those who answered no to question #5:

6.) Why hasn’t your university tried to implement any type of exposure? Please check all that apply.

a. Don’t have access to the appropriate resources needed to provide exposure

b. Anticipate it being too time consuming

c. Not sure how to start the process

d. No one thought about it
e. Little interaction with undergraduate students

f. Other
   i. Please specify

7.) What do you think are the benefits of undergraduate genetic counseling exposure?

Please check all that apply.

a. It introduces undergraduate students to the genetic counseling profession.

b. It helps prepare students to apply to genetic counseling graduate programs.

c. It strengthens students’ applications to genetic counseling graduate programs.

d. By teaching them more about the genetic counseling profession, it helps to ensure that those who apply to graduate programs are genuinely interested in genetic counseling as a career.

e. Other
   i. Please specify

8.) What exposures would you like to see at your university? Please check all that apply.

a. A genetic counseling minor/genetic counseling certificate program

b. A full course on genetic counseling

c. A science course that includes a lecture(s) about genetic counseling

d. A genetic counseling club

e. Other
   i. Please specify

f. None
For those that do not have undergraduate students at their institution:

2.) What do you think are the benefits of undergraduate genetic counseling exposure?

Please check all that apply.

a. It introduces undergraduate students to the genetic counseling profession.

b. It helps prepare students to apply to genetic counseling graduate programs.

c. It strengthens students’ applications to genetic counseling graduate programs.

d. By teaching them more about the genetic counseling profession, it helps to ensure that those who apply to graduate programs are genuinely interested in genetic counseling as a career.

e. Other

i. Please specify