

# Community Education of Personalized Breast Cancer Therapy Utilizing Students of Health Care Professions

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**Abstract:** *Introduction:* Health literacy is a growing problem that can further lead to altered decision making, an amplified variety of health conditions, and decreased survival rates. This study demonstrates that by providing brief, educational seminars to medically underserved members of local communities, we could improve patients' basic knowledge of breast cancer and explain specific treatment options that are available. Through this expanded knowledge, it is expected that patients will take a more active role in their own healthcare. *Methods:* The study began by developing a PowerPoint, based on a fifth grade reading level so all levels of education could be involved and understand how to respond. Topics such as breast cancer statistics, incidence rates, screening, risk factors, signs and symptoms, genetic testing and markers, and treatment were combined in order to give a diversity of subjects patients would benefit from in regards to breast cancer. Once created, pharmacy students reached out to local underserved communities to raise awareness about breast cancer and the many options patients have. Patients were given a pre-presentation survey in order to assess their basic knowledge of breast cancer. The survey consisted of a one (strongly disagree) to five (strongly agree) key to measure the patients understanding of various topics related to breast cancer. After the pre-presentation survey was completed, an educational breast cancer PowerPoint was presented. Questions were then asked and a post-survey (with the same questions as the pre-survey) was given in order to determine whether the presentation met its primary goal of elevating patient's awareness of breast cancer. *Results:* Whether breast cancer naïve or a survivor, the majority of the patients present reported expanded knowledge of breast cancer and felt that they were more confident in taking initiative in their healthcare. With an alpha level set at 0.05, all of the questions showed statistical significance. Three key elements that showed the greatest improvement of gained knowledge involved the causes of breast cancer (pre-score 2.9- post-score 4.6 (standard deviation 1.69)), signs and symptoms of breast cancer (pre-score 3.5-post-score 4.5 (standard deviation 0.96)), and treatment options available to the public (pre-score 3.3-post-score 4.6 (standard deviation 1.31)). This suggests that at baseline, the patients were comparatively less aware and educated on breast cancer then after the presentation, when the post-survey was given. By presenting the material with a pre- and post-presentation survey, this enables the amount of knowledge gained by participants to be measured, and helps shape future presentations to guarantee maximum awareness to the patients attending. *Conclusion:* By this study, it can be concluded that pharmacists play a vital role in increasing health literacy and perhaps a subsequent improvement in survival rates by promoting breast cancer education and community outreach. By utilizing pharmacy students as presenters, this enables patients to have their medication questions answered, but also provides a platform for furthering pharmacy student's education and skills as they develop into healthcare providers. The students also serve as a reminder that pharmacists are the most accessible healthcare provider, and a valuable resource for medical information and referrals.

**Keywords:** Breast Cancer, Medically Underserved Communities, Education, Students, Laurens, Greenwood, Counties, South Carolina, Genetic Testing

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## 1. Introduction

Though Breast cancer death rates have been declining for the past several decades in the United States, it is still the second deadliest cancer among women. Unfortunately, death rates are still disproportionately high among the medically underserved. [1, 2] These high rates are due to late diagnoses, lack of medical coverage, and unequal access to improvements in cancer treatment- resulting in lower survival rates. This category of patients have drastically low to nonexistent health literacy, which is very important in order for an individual to understand basic health information and make proper decisions regarding their healthcare and well-being. More than 90 million Americans (especially minorities, immigrants and adults with limited education) have been associated with poor disease management and worsening health outcomes due to their inability to understand basic health concepts. [3]

### 1.1. Study Purpose

The purpose of this study was to demonstrate the effectiveness of utilizing students of healthcare professions to provide brief, educational seminars to the medically underserved members of local communities. By doing this, patient's knowledge about breast cancer (associated risks of lifestyle choices and the role of genetics) and how to recognize signs and symptoms of breast cancer would expand, resulting in better treatment outcomes and lower death rates among these particular populations. The implementation of this study could connect the world of academic outreach programs and low-health literacy populations; allowing healthcare as a whole to transition to a more united, communicable, and budget conscious act and profession.

### 1.2. Significance

Through this study, one could conclude many significant outcomes that could play such a high role in moving healthcare forward, improving cancer outcomes, and successfully educate underserved communities without funding. With programs such as this research project, students have the opportunity to further their education and public speaking skills while making a difference in someone's life. Healthcare students could play a much bigger role in the future by providing services to medically underserved communities without funding, while pushing the issue of barriers in this country and optimistically overcoming them. With limited resources discussing the importance of community-based outreach programs, the relevance and significance of this inexpensive approach should be further recognized and supported. Hopefully with the continuance of this particular project, and other projects around the country, healthcare will transform this idea into the "standard" criteria individual hospitals, pharmacies, and learning institutions will implicate. "Strategy for Sustaining Cancer Education services for Underserved Communities" is

a very similar study that describes the challenges of finding cost-effective ways to reach out to minorities and medically underserved sub-groups in California. Similar to the "sub-groups" in South Carolina, we as healthcare professionals must continue to generate new ways to overcome ethnic, language, and education barriers in order to improve the understanding of breast cancer and increase opportunities for those living in underserved communities. In this particular study, similarly, students pursuing the healthcare profession conducted community-based cancer education programs and supported programs such as Every Woman Counts in order to help overcome barriers and promote free breast cancer screening services for low-income women. This study found that through the July 2010 through June 2015 a total of 10,520 women were reached out to about breast cancer, 7,403 women part took in a brief discussion, given a brochure, and a personalized message about breast cancer screening in the woman's preferred language, and 605 woman were involved in an "in-depth" discussion. 23.8% of the total outreach efforts were rejected, however many stated that they had previously visited the display, and were encouraged to relay their knowledge to other women about getting screened. [4] Though not specific to breast cancer, similar efforts have been described in previous research. Wu (2013) explains the collaboration between academics and community out-reach programs. The outcome of the study further strengthened the community as a whole and helped implement cancer information and awareness throughout the population. [5]

As more discoveries come forward linking specific genetic components with various types of cancer; information the patients are receiving about their disease becomes even more intricate. Often times, patients become extremely overwhelmed with genetic information, because this type of material surpasses the health literacy level of the majority of the nation. For example, there are many polymorphisms in breast tumor suppressor genes that are inherited, such as the BRCA1 and BRCA2 genes. It is estimated that 0.2-0.33% of the population have BRCA1 or BRCA2 gene mutations. [6] When this type of germline variation is genetically inherited, women have an 87% higher risk of developing breast cancer than those women that do not have this type of variation. [1, 7] Genetic testing have more recently been utilized in clinical settings in order to improve the rate of screening, testing, and early diagnosis of breast cancer. With this breakthrough, patients have the opportunity to gain more understanding about different germline variations (including BRCA1 and BRCA2 genes), and determine whether they have a polymorphism or not. Outreaching to medically underserved communities, and counseling them on different components of breast cancer will ultimately result in patients understanding complex diagnoses and lead them to the ability to advocate for their own health despite their potentially low health literacy levels.

The National Comprehensive Cancer Network (NCCN) recommends assessing risk of breast cancer by one,

determining if the patient has any known genetic predisposition (BRCA1/2), and two, further genetic risk evaluation should be done on women who do not have a personal history of invasive breast cancer but are members of a family member with known mutations, have had 2 or more breast cancers, have had 2 or more individuals with breast cancer on the same side of the family, have one more primary invasive ovarian cancer, or have a first or second degree relative with breast cancer. If suspected, clinically, it is important to screen for breast cancer in order to reduce mortality, thus educating patients about screening is a vital element to a successful diagnosis and treatment. In women at higher than average risk (family history, poor lifestyle choices), NCCN recommends an annual mammography screening beginning at age 30. Annual screening mammography plus magnetic resonance imaging is recommended at the age of 30 for women with known BRCA mutations or first-degree family members with BRCA mutation. [6] Mammogram screenings may reduce mortality by approximately 15% for women under the age of 60. [8] Early detection by mammography results in patients having higher survival rates, and may have a larger range of treatment options (including breast-conserving surgeries and lower dose chemotherapies, with fewer side effects). Unfortunately, for medically underserved patients only 38% have received a mammogram within the past two years, compared to 68% in patients over age 40 in the general population. [1] Patients in medically underserved communities often do not recognize the importance of screening in regards to early detection, and how early detection can benefit them in the long-run. [9] Educating patients on the value of these screening tools may result in improved prognoses leading to an increase in early-stage diagnoses and improved survival rates overall. [8]

Understanding genetic markers and the development of breast cancer has a vital role in building a treatment plan and determining the prognosis for a patient. Tumor tissue tests are recommended for every primary invasive breast cancer. [6] Somatic alterations that affect the receptor status of some tumors include hormone receptors (HR), such as estrogen and progesterone receptors (ER/PR) and protein receptors such as the human epidermal growth factor receptor type 2 (HER2) expressions. There are many combinations of receptor types that a patient can have in breast cancer. One, patients can be hormone receptor positive (HR+/HER2-), though most seen in non-Hispanic white women [10], over 80% of breast cancers are ER+, and nearly 65% are PR+. [11] In 20% of breast cancers, cells make too much protein known as HER2, leading to a very aggressive and fast growing cancer [11]. HER2 positive (HR-/HER2+) patients are associated with decreased overall and relapse-free survival [6]. Lastly, though seen mostly in non-Hispanic black women, patients can be “triple negative” (ER-/PR-/HER2-), which leads to a poorer prognosis and higher recurrence rate [10]. Based on what type of somatic alterations and receptor markers are present, treatment can be tailored specifically to the patient. There are three categories

of treatment being used to stop the progression of breast cancer: traditional chemotherapy, hormonal therapy, and targeted biologic therapy. Traditional chemotherapy consists of drugs that focus on rapidly dividing cells, such as hair, nails, and tumor cells. There are three different classes of drugs that can be offered during this therapy including, Anthracyclines- which damage the genetic material of cancer cells, Taxanes- which interfere with how the cancer cells divide and Antimetabolites- which act on certain cancer cells genes. Medications in this category consist of drugs such as: cyclophosphamide (Procytox), doxorubicin (Adriamycin), epirubicin (Ellence), and methotrexate (Trexall). Patients with positive estrogen and progesterone receptors benefit from hormonal or endocrine therapy, such as tamoxifen (Soltamox). Tamoxifen blocks hormone receptors preventing hormones from binding to them. Patients with HER2+ receptors benefit from targeted biologic therapy, such as trastuzumab (Herceptin). [12] Trastuzumab is used in combination with chemotherapy, and is a humanized antibody that targets the HER2 protein receptor. [13] Other prognosis factors include tumor size, node status, presence or absence of metastasis and tumor grade. [12] Continuing to educate our communities about new markers and treatment plans optimistically will encourage patients to develop personalized treatment plans with their doctors incorporating targeted therapies. The federal *Healthy People 2020* 10-year initiative is to improve health throughout America, and reduce the number of new cancer cases and cancer-related deaths. Expectantly, this expanded knowledge will lead to the promotion of healthier choices such as regular screening and empower patients to take a more active role in their own healthcare.

## 2. Methods

### 2.1. Study Description

The *Community Education of Personalized Breast Cancer Therapy Utilizing Students of Healthcare Professions* study is a cross-sectional, pre- and post-test study, which was approved by the IRB at Presbyterian College School of Pharmacy. The study began by developing a presentation at a 5<sup>th</sup> grade reading level so most levels of education could be involved, understand, and respond. Breast cancer topics such as statistics, incidence rates, screening, risk factors, signs and symptoms, genetic testing and markers, and treatment were covered in the seminar to give a thorough overview that attendees would benefit from. Once the presentation was created, two students reached out to local underserved communities to raise awareness about breast cancer and the many options patients have. The presentation started out with a short survey of questions shown in Table 1 to ascertain the knowledge of the community members about breast cancer. The breast cancer seminar was then offered, and immediately after another survey shown in Table 2 were administered to gather the knowledge of whether the presentation met its goals. These goals included: attendees obtaining knowledge

in areas not previously understood, and confidence in taking a more active role in their own healthcare. The goal of presenting this education in lower health literacy/medically underserved communities was to enhance patient understanding of breast cancer through the following:

- emphasizing early detection through routine screenings
- explain the screening guidelines
- discussing how genetics, family history, and lifestyle could increase risks
- signs and symptoms that can help with early detection
- explain cancer staging and how doctors apply it to treatment
- exploring the different classes of medication used in breast cancer therapy

By educating the patients on breast cancer, the study hopes

that patients gain confidence and become one of the team members in the journey of choosing a treatment plan. Along with their own disease, the study was designed for patients to gather information they never knew and spread it to others within their area. Presenting material with pre- and post-presentation surveys enables the amount of knowledge gained by participants to be measured, and helps shape future presentations to guarantee maximum awareness to the patients attending.

### 2.1.1. Pre-Seminar Survey

The next few questions will assess your understanding of breast cancer before the seminar. Please rate the following statements by placing a check mark in the box that best represents your opinion on the statement.

**Table 1.** Pre-seminar survey given to the class before the breast cancer education presentation. This survey was used to evaluate previous knowledge of breast cancer and treatment in geologically-different medically underserved communities.

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
I know the causes of breast cancer.					
I know that breast cancer can be inherited through the family members.					
I know that breast cancer screening increases the chance of detecting a potential tumor in the breast.					
I know that certain factors can increase my chances of getting breast cancer.					
I know the sign and symptoms of potential breast tumors.					
I am knowledgeable about the guidelines involved for breast cancer screening.					
I know the treatment options that are available for breast cancer patients.					

Please provide any suggestions or comments about the seminar.

### 2.1.2. Post-Seminar Survey

The next few questions will assess your understanding of what you learned in the breast cancer seminar. Please rate the following statements by placing a check mark in the box that best represents your opinion on the statement.

**Table 2.** Post-seminar survey and reflection given to class to assess whether the presentation's goals were met of increasing breast cancer awareness in medically underserved communities.

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
The breast cancer seminar showed me the importance cancer awareness and breast cancer treatment.					
I learned how breast cancer can be inherited through family members.					
I know the importance of breast cancer screening for detecting a potential tumor in the breast.					
I understand that certain factors can increase your chances of getting breast cancer.					
I felt that the breast cancer seminar was very informative in explaining the causes for breast cancer.					
I understand the signs and symptoms of breast cancer.					
I understand the guidelines involved for breast cancer screening.					
The breast cancer seminar was informative in explaining the treatment options for breast cancer.					

Please provide any suggestions or comments about the seminar.

## 2.2. Study Population and Data Source

Presentations were conducted in Laurens and Greenwood Counties of South Carolina. These communities provided an adequate representation cross-section of the targeted population (medically underserved patients). Presentations were held at local churches, community centers, and hospital classrooms; providing the patients with a familiar and comfortable environment.

Inclusion criteria was open to anyone interested in learning

more about breast cancer, included adults of all ages, from all income levels, with varied ethnic backgrounds and education levels. Patients were not only provided with knowledge and basic communication tools, but with contact information linking them with resources and services; to ensure that they obtain the best care possible.

The survey scores were measure using a five-point Likert scales and the data was statistically evaluated using a paired t-test. Independent variables included educational presentation about breast cancer, its genetic components, and

prevention and treatment options. The dependent variable included the outcomes represented by the post-presentation surveys. This was measured based on the percentage of improvement between the pre- and post-presentation survey. The surveys assess the change from baseline in attendees understanding:

- a. the importance of breast cancer awareness
- b. guidelines for routine screening
- c. risk factors associated with lifestyle and family history
- d. causes of breast cancer
- e. signs and symptoms that indicate breast cancer
- f. staging and how doctors use it directly with treatment options
- g. variety of medication options available
- h. how the patients can work with their healthcare team to personalize their treatment

### 2.3. Study Education

The breast cancer education session was steered by two different segments with tools, such as a take-home vocabulary list that further defines unfamiliar words, handouts with blank charts for individual genetic history mapping, breast health self-awareness information, breast self-exam chart, and contact information for community services. These type of services included cancer screening, genetic testing, genetic counseling, and financial assistance programs.

The presentation began by discussing the *Healthy People 2020*, describing to the audience how high the incidence and deaths of breast cancer that are still occurring in today's society. By starting with this topic, it helped incorporate the importance of early detection and routine screenings. The different types of screenings, how and when they should be performed, and the significance of early recognition were thoroughly discussed. Attendees were then offered a list of risk factors, such as negatively-influenced lifestyles, and family history. Polymorphisms such as BRCA1 and BRCA2 were explained by illustrating the family history of a well-known actress with a germline BRCA1 variation. By doing this it showed the audience that anyone can be susceptible to having this disease. The seminar demonstrated how harmful variants can significantly increase patient's risk for developing breast and ovarian cancer. The basic of genetics

were then defined, variable penetrance was explained, and the importance of genetic testing in those with strong family histories of breast cancer was emphasized. Prophylactic treatments like mastectomy and oophorectomy were discussed, while the concept of individuality in treatment options was constantly reinforced. Each presentation was tailored to allow ethnic, generational and educational differences among the attendees, with the goal of providing the maximum benefit for everyone. This was completed by altering the language used, putting the majority of topics covered in laymen's terms. Pictures and real-life scenarios were also put in the presentation to address everyone's different learning styles.

The second half of the presentation was more focused on treatment. The presenters explained staging (0-IV) in breast cancer and how it reflects on what treatment is received. This was later related to the "TNM" system (Tumor, Nodes, and Metastasized); tumor images, and the promotion of growth (through estrogen and progesterone) were also tied into this discussion. As a whole, the community is well aware that the majority of the population with breast cancer will undergo chemotherapy, leading to the enforcement of the goal of the presentation: to explain the variety of medications that are available to patients. Then specifically the different types of treatments were discussed using illustrations and common terminology. Attendees were then encouraged to complete the post-survey and ask any questions that they had during the presentation.

## 3. Results

Table 3 shows a representation of the difference between the average scores of each question in regards to the pre-survey and the post-survey. With an alpha level set a 0.05, all of the questions showed statistical significance. Three key elements that showed the greatest improvement involved the causes of breast cancer (pre-score 2.9-post-score 4.6 (S.D. 1.69)), signs and symptoms of breast cancer (pre-score 3.5-post-score 4.5 (S.D. 0.96)), and treatment options available to the public (pre-score 3.3-post-score 4.6 (S.D. 1.31)). This suggests that at baseline, the patients were comparatively less aware and educated on breast cancer then after the presentation, when the post-survey was given.

**Table 3.** Average Pre- and Post-survey results on generalized breast cancer awareness.

Question	Pre-survey	Post-survey	S.D.	P value
I know the causes of breast cancer	2.9	4.6	1.69	<0.001
I know that breast cancer can be passed down through family members	4.1	4.6	0.53	<0.001
I know that breast cancer screening increases the chance of detecting cancer	4.2	4.6	0.44	<0.001
I know that certain factors can increase my chances of getting breast cancer	4.0	4.5	0.55	<0.001
I know the signs and symptoms of potential breast tumors	3.5	4.5	0.96	<0.001
I am knowledgeable about when, how, and how often I should be screened for cancer	3.6	4.5	0.95	<0.001
I know the treatment options that are available for breast cancer patients	3.3	4.6	1.31	<0.001

## 4. Discussion

This study discusses the connection between medically underserved communities and the impact pharmacists can

have on a patient's survival and quality of life. Pharmacists are on the frontlines of the community providing healthcare. Pharmacists help promote early detection through screening, lifestyle changes, and specific treatments, which is a key

component in the promotion of public health [14], (such as decreasing death and increasing survival rates). In 2016, there were more than 2.8 million people with a history of breast cancer [15]. These numbers were greater among older, low-income, and minority women. [16] The American Cancer Society reported that the most critical issues within these groups were as follows:

- a. poor people meet certain barriers when they attempt to seek diagnosis and treatment of cancer
- b. poor people and their families make several sacrifices when attempting to obtain cancer care and therefore often do not seek care because of the barriers faced
- c. poor people also experience more pain, suffering, and death because of late diagnosis and treatment at an advanced stage of the disease
- d. fatalism about cancer is more common among the poor, thus preventing them from seeking care. [17]

There is steady evidence indicating a link between low literacy and unsuccessful health outcomes. [18] Lower literacy results in recurrent and unproductive doctor visits, leading to an increase in cost and use of the healthcare's budget. This is mainly due to these individual's increasing length of stay in the hospital. [18] There are great opportunities for healthcare providers to educate these patients, and help them get past these obstacles. By providing these patients with resources as well as breast cancer awareness, it is expected that these low-income patients (and other minorities) will become more proactive in their treatments. With more research, these patients should increase their understanding of how to obtain, interpret, and comprehend health-related information needed to make a suitable decision about their healthcare. [14] In *A Community-based Collaborative Approach to Improve Breast Cancer Screening in Underserved African American Women*, the study explained how as a community we need to strive to bridge the gap between at-risk minorities and healthcare providers. Healthcare providers need to help provide education and encouragement with goals of improving awareness, increasing screenings, and dismissing the misunderstandings about breast cancer, screening, diagnosis, and treatment. [19] Low health literacy significantly hinders their search for breast cancer screenings and early detection [20]. Therefore, this study focused on a wide variety of patients, of all different educations, ethnicities, ages, and incomes. This will help determine if education can help increase prevention, interventions, and strategies for survival. Results showed that by educating these individuals on the key points of breast cancer, their knowledge of their diagnosis and the disease were increased. Based on the pre- and post-survey, participant's knowledge increased at least 8% (question 3-refer to Table 1) from pre- to post- in every category to as much as 34% (question 1-refer to Table 1). Evaluating the change in baseline between the pre and post-seminar surveys not only allows the presentation to be adjusted for maximum benefit to future attendees; it is a valuable tool for training students to adjust their presentation styles to maximize the benefit to participants.

For future presentations, students at Presbyterian College School of Pharmacy will undergo a class in which genetic experts will teach them the basics of presenting breast cancer information to the public. After the class, each student will then be certified to educate local communities about breast cancer awareness, the relevance of it, screening, and treatment. By allowing the study to be a "train-the trainer" workshop, the program is able to continue to provide future pharmacy students with this educational opportunity, as well as increasing the populations reached and exposing these underserved communities to advances in treatment. By utilizing pharmacy students as presenters, this enables patients to have their medication questions answered, but also provides a platform for furthering pharmacy student's education and skills as they develop into healthcare providers. This is a unique opportunity for students because they will be able to be a part of not only a "school project" but bettering their society and increasing health literacy of those that do not have the resources themselves. In the United States, there are more than 60,000 pharmacies [21] available to the public. Pharmacies are now offering extended health services in the retail setting, including disease awareness and educational points including OTC, specialty drugs, and vaccinations. Pharmacist now are providing services through advanced programs that allow patients to learn more about health conditions and disease states in a more convenient way[22]. The students serve as a reminder that pharmacists are the most accessible healthcare provider, and a valuable resource for medical information and referrals.

## 5. Limitations

A limitation of this study is that one of the presentations was done with a Cancer Association. The pre-survey data may be higher than expected due to many of the attendees having cancer before and are knowledgeable on the majority of the topics spoken about. Another limitation to this study was the demographics were not defined. For future studies, the population should be clearly examined so the results can determine the correlation between health literacy and demographic characteristics.

## 6. Conclusion

With such a growing project, the impact of this message to low literacy communities could be exponentially progressive in the future of healthcare. By allowing pharmacy students to learn from teaching key information about breast cancer awareness/screening, genetics, and treatment alternatives to whom otherwise would not get this pertinent information in an every day passing. Utilizing the promotion of active awareness and educational cancer presentations, opportunities for medically underserved communities will rise; allowing them to be proactive and navigate their own decisions about their health and individualized treatment options.

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