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Effects of an Educational Evidence-Based Website to Improve Breast Health Knowledge and Self-Efficacy of Breast Self-Examination: Interim Analysis

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Effects of an educational evidence-based website to improve breast health knowledge and self-efficacy of breast self-examination: interim analysis.

Purpose and Aims
Breast disease, whether benign or malignant, encompasses a wide array of diagnoses. Breast self-examination (BSE) is a simple screening assessment that improves early recognition and diagnosis. With changes in the 2021 ACOG practice guidelines from mandatory to optional provider-performed clinical breast examinations (CBE), it is imperative for patients to possess basic breast health knowledge and accurate BSE techniques. Current standard patient education is provided via brochures or pamphlets. An educational multimedia website was created using ACOG guidelines to impart knowledge and demonstrate proper BSE techniques. Aims were to evaluate changes in participant's (1) breast health knowledge (2) self-efficacy in performing BSE.

Theoretical Framework
The educational intervention was developed using the Health Belief Model (HBM) which assesses individuals' behavior and actions regarding health conditions. Model concepts include 1.) health susceptibility, 2.) seriousness, 3.) benefits/barriers to a behavior, 4.) cues to action, and 5.) self-efficacy. This research assessed behavior towards breast health knowledge and self-efficacy of BSE.

Methods
A single group, pre/post efficacy design was used. Breast health knowledge was assessed with the *Breast Health Assessment (BHA)* and consisted of three subscales; (1) breast cancer signs and symptoms (2) breast cancer risk, and (3) BSE knowledge. The *Champions Health Belief Model Scale (CHBM)* assessed BSE self-efficacy and consisted of five subscales; (1) susceptibility, (2) seriousness, (3) BSE benefits, (4) BSE barriers, (5) BSE efficacy, (6) health motivation, (7) mammography benefits, and (8) mammography barriers. The validated instruments were collected at pre-intervention (Time 1) and 1-month post-intervention (Time 2). Paired t-tests determined change in all outcome measures. Participants were provided the website link at Time 1 and had access throughout the study. To reduce attrition, text and email reminders were sent at Time 2.

Interim Analysis
A convenience sample of 62 participants were enrolled. The BHA and CHBM at Time 2 were completed by 18 and 24 participants, respectively. Mean age was 44 years (SD = 12.7). Most of the sample were Caucasian and college educated. Thirty-six percent were on hormone contraception or replacement therapy. Eighteen percent had a personal history of breast disease and 46% had a family history of breast cancer.

Statistically significant increases were found in the BHA subscale of "breast cancer signs and symptoms *(p=.024, d=.58)*, and on the CHBM subscale of "mammography barriers" *(p= .023, d=.51)*. A positive trend was demonstrated in the BHA subscale of "BSE knowledge" as was the CHBM subscale of "BSE efficacy."

Conclusion
Participants gained the greatest knowledge with the BHA subscale of breast cancer signs and symptoms and the CHBM subscale of mammography benefits. These findings may translate to increased awareness of early detection and diagnosis. Interim analysis demonstrates attrition to

be higher than expected. Considerations to improve retention include provision of one-on-one education of content and use of website at Time 1. Weekly "booster videos" may promote retention. Limitations include time between pre- and post-intervention (1 month). This is an interim analysis; final data has not yet been measured.

Introduction

Breast self-examination has been in practice for over seventy years and yet consistent guidelines remain controversial. Some recommendations for breast self-examination indicate it should be performed once per month, approximately one week after menstruation begins (Albeshan et al., 2020). Others suggest no time frame but encourage women to be aware of the general condition of their breasts (Dietze et al., 2020). Many variations of breast self-examination exist and a standard protocol for BSE has not been established leaving those born female at birth to feel confused.

Many breast screening methods exist such as mammography, clinical breast exam, and BSE. Clinical breast exams are performed by a healthcare provider and BSE is performed by the person independently (Dietze et al., 2020). Recommendations for both clinical and self-breast examinations vary due to lack of evidence of decreased mortality rates from breast disease (Albeshan et al., 2020). Providers have different opinions about whether to perform a clinical breast exam. The lack of standard protocols about breast awareness leads to skepticism by providers and their patients. Conversely, other studies show BSE to be an effective and safe screening practice for breast abnormalities, particularly in lower income countries or in areas where more comprehensive breast screening methods, such as mammography, are less available.

Evidence suggests that insufficient knowledge on how to perform a BSE and lack of support contribute to low BSE rates (Labrague et al., 2020). It has been hypothesized that an increase in knowledge of breast health issues could help in early detection of breast cancer and

other non-cancerous diagnoses. With an increase in self-efficacy in BSE, women may be able to recognize signs and symptoms to that require further evaluation. Educational interventions about breast health have been shown to create motivation and increase self-efficacy in performing breast self-examinations (Tewelde et al., 2022).

Lack of education is due to several factors: lack of personal belief in need to screen, fear of abnormalities, and social stigma concerns. Disparities in knowledge between women in low-socioeconomic communities and higher-socioeconomic communities have been identified (Akhtari-Zavare et al.; 2016; Albeshan et al., 2020; Dietze et al. 2020; Rademaker et al., 2022). Many women believe that finding any type of abnormality in their breast means a diagnosis of breast cancer. Education of the signs and symptoms of breast cancer and potential diagnosis is lacking (Dietze et al., 2020). Innovative educational modalities through multi-media, websites, mobile applications, or face-to-face interactions will help enable early detection of disease (Karimian et al., 2022; Labrague et al., 2020; Nasution et al., 2021, Tewelde et al., 2022). Multimedia is defined as providing information by video, audio clips, and photographs (Karimian et al., 2022).

Problem

Adequate research about a female at birth's knowledge and self-efficacy to perform a BSE is lacking in the United States. Due to paucity of evidence, conflicting recommendations on the frequency and necessity of breast self-examination led to knowledge deficits among women. Increasing knowledge, retention, and self-efficacy in the performance of BSE will enable women to detect breast abnormalities to take prompt appropriate measures.

Available Knowledge

A literature search was performed using health-related databases including CINAHL, PubMed, PsychInfo, and Embase using the key words 'self-breast examination', 'self-breast exam', 'breast assessment', 'self-breast assessment', 'breast palpation', 'women', 'female', 'self-efficacy', 'competence', and 'motivation'. In terms of the educational piece of the systematic review, key words included 'patient education', 'patient teaching', 'discharge education', 'educational program', and 'patient instruction'. This was a comprehensive search through all the previously listed medical databases. There were many types of studies performed that included qualitative, longitudinal, cohort, systematic review, and pre/post-test questionnaires. Over 1,000 articles were selected with these search terms, but 40 studies have been identified as meeting the criteria for this systematic review. Articles were removed due to the exclusion criteria.

Breast Education

A need addressed in literature involved how to best educate the population regarding breast health, signs of breast cancer, and how to best perform a BSE. More than 80% of participants in a study in Ethiopia stated that there were never taught about breast health or BSEs (Assfa, 2022). A study by Akhtari-Zavare (2016) examined the effect that a breast health education program has on the belief and knowledge of breast health and self-efficacy in performing a BSE. A positive correlation was demonstrated between attending an education program and increased knowledge, along with an increase in self-efficacy (Akhtari-Zavare, 2016). Education regarding breast health and breast cancer has shown a positive correlation to BSE (Akhtari-Zavare, 2016; Zhang et al., 2021). Women over 65 have an increased risk of developing breast cancer and are more likely to be educated about breast health (Assfa, 2022; Xie et al., 2019). In comparison, younger women

have little guidance about performing a BSE or abnormal signs and symptoms related to breasts (Albeshan et al., 2020; Assfa, 2022).

Women in multiple studies state they were never taught about breast health when they were young (Akhtari-Zavare, 2016; Albeshan et al., 2020; Assfa, 2022; Karimian et al., 2022; Glanz et al., 2008; Rademaker et al., 2021; Sadoh et al., 2021; Zhang et al., 2021). Symptoms, risk factors, and timing of screening for breast cancer are the most common misconceptions that women face (Rademaker et al., 2021). Socioeconomic and financial status were frequent barriers that affected women gaining the appropriate knowledge (Albeshan et al., 2020). Also, a deficit of educational programs that discussed appropriate breast health information was a common report for women (Rademaker et al., 2021).

Knowledge deficits of breast health have a correlation with failure to improve modifiable risk factors associated with abnormal breast diagnoses. Young women who have not been educated about breast health have higher rates of progressive breast cancer and poorer outcomes (Sadoh et al., 2021). Providing education to young women can increase self-efficacy, identify abnormalities at earlier stages, and lead to lifestyle changes related to modifiable risk factors (Sadoh et al., 2021).

Self-Breast Exam

Less than half of the female population knows how to perform a BSE (Tewelde et al., 2022). Dewi et al. (2022), utilized a questionnaire given to 204 women between the ages of 18-65 years to assess their intentions to perform a self-exam, and it was found that younger participants are less likely to perform a breast self-examination. Women who are already BSE performers have a higher intention to perform BSE, perceive greater benefits to performing BSE, and increased breast cancer knowledge and understanding (Dewi et al., 2022; Zhang et al., 2021). Those with insufficient knowledge were unable to identify typical abnormal signs when presuming BSE (Dewi

et al., 2022; Zhang et al., 2021). The decreased understanding on how to perform a BSE increased confusion and fears of possibly not detecting abnormal symptoms (Dewi et al., 2022; Rademaker et al., 2021).

Education about the importance of breast self-examination and providing teaching moments to show women how to perform a BSE accurately, can be preventative measures for the female population. After reviewing multiple articles discussing attitudes, knowledge, and self-efficacy with breast self-examinations, it has become evident that there is a lack of knowledge in females (Rademaker et al., 2021, Tewelde et al., 2022, Zhang et al., 2021). The lack of knowledge leads to negative attitudes and reduced self-confidence (Rademaker et al., 2021). Educational tools can be used to encourage women to understand their bodies, learn how to perform a BSE, and improve odds of identifying abnormalities early.

The most common sources of information about how to perform a BSE were radio or television (Tewelde et al., 2022). Very few women stated that they were taught by providers or educated in schools about how to perform a BSE (Rademaker et al., 2021; Tewelde et al., 2022). Providing educational materials or programs will help ensure that women are accurately practicing BSEs (Nasution et al., 2021; Tewelde et al., 2022).

Self-Efficacy

Self-efficacy is defined as a person's perception of their own self-confidence (Xie et al., 2019). Most articles discussed the relationship between the lack of breast health knowledge and self-efficacy (Rademaker et al., 2021; Labrague et al., 2020; Karimian et al., 2020). According to Xie et al. (2019), the lack of education provided to young women directly affects their self-efficacy. Over fifty percent of women have below-average knowledge related to breast health (Xie et al., 2019). A lack of guidance for young women about performing a BSE leads to poor confidence

(Assfa, 2022). Improving breast health education for young women in the clinic setting and through a multimedia site may positively affect self-efficacy (Albeshan et al., 2020; Rademaker et al., 2021; Xie et al., 2019). Therefore, assessing the level of knowledge about breast health is a strong predictive factor for self-efficacy (Xie et al., 2019).

Multi-Media Education

A valuable educational tool is multimedia, which provides easy access to academic material. Travel to healthcare providers for education can be intimidating and inconvenient (Karimian et al., 2022). With the increase of social media and technology, educational multimedia tools may be beneficial in reaching a larger population about breast health (Nasution et al., 2021). Text messages, social media, or websites have the promise of improving education for women on breast health and BSE techniques. Independent use of multimedia enables women to learn at times that are most convenient to them (Nasution et al., 2021).

Karimian et al. (2022) explored the use of video-based multimedia compared to face-to-face training in advancing knowledge and understanding of women to breast neoplasms and BSE. The population included 100 women aged 18-60 assigned to a face-to-face and video-based education group using random multiple cluster sampling. No significant difference was found in breast cancer knowledge between the two groups; however, both groups showed improvement after intervention. There was also not a significant difference between the two groups when assessing the performance of BSE (Karimian et al., 2022). According to Sadoh et al. (2021) a significant increase was found in students knowing how to perform a BSE following education provided by peers. One limitation found with using a video-based multimedia source was the inability to visualize breast self-examinations on an in-person mannequin and ask questions with

a healthcare professional (Nasution et al., 2021). Both studies demonstrate the positive effect of education on knowledge and self-efficacy regardless of the modality.

Rationale

The Health Belief Model (HBM) has been used extensively in research of breast health. This model assesses a person's behavior toward disease (Tewelde et al., 2022). The focus will be to assess the participants' behavior toward self-breast exams and breast health. One of the primary purposes of this research was to assess the self-efficacy of those greater than 19 years of age and assigned female at birth about their breast health. Self-efficacy is one of the main components of the HBM. The original model was developed in the 1950s by psychologists in the U.S. Public Health Service (Glanz et al., 2008). Their goal was to protect and prevent people from contracting diseases. The main subjects assessed through this theory are susceptibility, seriousness, benefits and barriers to a behavior, cues to action, and self-efficacy (Glanz et al., 2008).

Specific Aims

The purpose of this research is to contribute to the body of literature regarding the improvement of knowledge and comprehension of breast health and BSE and how a standardized breast health education tool can influence breast health knowledge and self-efficacy. The research will utilize a multimedia website to (1) increase participants' knowledge about breast health, (2) increase participants' self-efficacy in performing BSE. Multimedia can be defined as "a system of relaying information or entertainment that includes many different forms of communication" (Karimian et al., 2022).

Methods

Context

The research is a single group, pre/post study efficacy design. Participants included those that are assigned female at birth and desire to improve their knowledge of breast health education and self-efficacy in performing BSE. The education was provided utilizing a multi-media website. All education on the website is evidenced-based and developed through literature review. The American College of Obstetricians and Gynecologists (ACOG) recommends preforming breast self-assessments to become familiar with the usual feel and appearance of the breast. One of the ways to assess breast tissue is by preforming BSE (ACOG, 2021). The guidelines from ACOG were used to develop the educational material. The variables studied are knowledge of breast health and performance of BSE, and self-efficacy of performing breast health promotion. Another variable will evaluate participant's perceptions of the ease of access, benefits, and barriers to acquiring breast health education via the multimedia website using the Usability Questionnaire. Variables will be assessed using pre- and post-intervention questionnaires.

The study has been conducted at a rural ambulatory outpatient clinic in Nebraska that employs a women's health nurse practitioner. Other employees at the clinic include two physicians, one physician assistant, and one family nurse practitioner. The rural clinic is a family practice that is owned by the local hospital and will see over 300 patients a week. The second study site is an urban ambulatory outpatient clinic in Nebraska focusing on breast health concerns and employs three physicians and one Nurse Practitioner. The urban clinic sees over 200 patients a week. A third clinic in the urban location employs 19 physicians and several nurse practitioners. This clinic focuses on obstetrics and gynecology. All sites see patients with a potential need for breast health education.

Inclusion criteria are those who are assigned female at birth, aged 19 years of age and older, who speak, read, and write English at a seventh to ninth grade reading level, and have access to a smart device such as a phone, tablet, or computer. Age is addressed within the inclusion criteria as the study seeks to evaluate those that are the age of majority and therefore a pediatric population will be avoided. To prevent any miscommunication regarding language, participants must be able to speak, read, and write at a seventh to ninth grade reading level, due to the language of some anatomical features of the breast. The multimedia website can be accessed with a QR code and/or website link. Therefore, participants must have access to a smart device or computer to fully participate in the research study. This study utilizes a convenience sampling based upon patients scheduled to be seen in either the rural or urban clinics within the sampling timeframe that meet the inclusion criteria.

Exclusion criteria includes those assigned male at birth, those younger than 19, those who are pregnant or breastfeeding, or those undergoing current treatment for breast disease (Casanova et al., 2019). Breast tissue is rapidly developing and changing in adolescent females, which can make it difficult to try to educate this population (Casanova et al., 2019). Females assigned at birth that are pregnant have the risk of inducing labor when their breasts are stimulated. Also, females breastfeeding will have different breast tissue compared to their typical breast tissue when they are not breastfeeding (Casanova et al., 2019). This could become confusing and worrisome if women are not appropriately educated about the difference between their normal breast tissue and how their anatomy is different when breastfeeding. The majority of those assigned female at birth will not be breastfeeding in their lifetime, so thorough education about their breast tissue when they are not breastfeeding is appropriate. Those undergoing current treatment for breast disease will have abnormal breast tissue and would have a difficult time

trying to assess for other abnormalities. Excluding this population will help decrease stress and confusion about appropriate self-breast examination.

Interventions

The study has been conducted at a rural ambulatory outpatient clinic in Nebraska that employs a women's health nurse practitioner. Other employees at the clinic include two physicians, one physician assistant, and one family nurse practitioner. The rural clinic is a family practice that is owned by the local hospital and will see over 300 patients a week. The second study site will be a urban ambulatory outpatient clinic in Nebraska focusing on breast health concerns and employs three physicians and one Nurse Practitioner. The urban clinic sees over 200 patients a week. A third clinic in the urban location employs 19 physicians and several nurse practitioners. This clinic focuses on obstetrics and gynecology. All sites see patients with a potential need for breast health education.

Two researchers visited an urban clinic to obtain data, and the third researcher visited a rural clinic. The researchers informed the providers of the inclusion/exclusion criteria and provide a scripted tool that introduces the aim of the study and general requirements of the participant. The general requirement of the participant includes answering four questionnaires and visiting an educational website.

Upon informed consent being obtained, the participants were given a questionnaire to obtain demographic information through the Demographic Survey. The researchers provided scripted information that reviews the process of obtaining the pre-test and then how to access the interventional education website. The participants took the Breast Health Assessment (BHA) and Champion's Health Belief Model (CHBM) assessment as a pre-test. After completing the

questionnaires, the participant was provided the QR code for the website for the educational material.

One week after the participants gave consent, they were sent communication via email and SMS messaging, or per participant's preference, to remind them to review the website if they have not already done so. At Time 2, the participants retook the Champions Health Belief Model and the Breast Health Assessment via email. This will evaluate for breast health knowledge improvement and the perceived self-efficacy. The participants will receive the BHA and CHBM along with the Usability of Website questionnaire at Time 3. (Table 1).

Study of Interventions

To measure the perception of the intervention on participants and the effects of an educational, evidence-based website, a pre/posttest was administered. At the initial visit (Time 1), participants were provided the Demographic Survey, BHA, and CHBM to assess baseline knowledge regarding breast health and self-efficacy of BSE. After completing the questionnaires, participants received a QR code to access the educational website and were encouraged to view the website as many times as desired. One month later (Time 2), participants received 2 emails each containing the same questionnaire (BHA and CHBM) to assess if their breast health knowledge and self-efficacy of BSE had improved. Scores of both questionnaires were compared from Time 1 to Time 2.

Measure

Four tools will be used in this study (Table 1, Appendices 1-4). The Demographic Questionnaire, the Website Usability Questionnaire, and the BHA are self-designed by the researchers; therefore, reliability and validity of these tools are not established. The self-designed tools were reviewed prior to use by multiple experts in the field of Women's Health and breast education. The questionnaires were designed after a thorough literature review. Each

questionnaire was determined to be at a ninth-grade reading level according to the Flesch-Kincaid Grade Level. During the interim analysis, the Demographic Questionnaire, BHA, and CHBM were evaluated through Time 2.

The Demographic Questionnaire is self-designed based on literature review. It consists of 13 questions that assess the participants' age, family history of breast disease, and social determinants (Appendix 1). Smoking cessation is evaluated due to the increased alterations to breast tissue (Sadoh et al., 2021). The impact of hormonal contraceptives or hormone replacement therapy can affect breast health and will be assessed in this questionnaire (Rademaker et al., 2019). Surgical interventions of the breast can also alter breast tissue and will be included in the questionnaire (Rademaker et al., 2019). There are no correct answers. This tool will be given at Time 1.

The Breast Health Assessment includes a fifteen-item questionnaire that assesses a participant's knowledge using the terms "agree", "disagree", or "unsure". Items coded as "unsure" will be regarded as an incorrect answer. Correct answers are selected in the questionnaire in Appendix 2. The questionnaire will be assessed as the correct number of answers out of fifteen. Due to lack of literature about a general baseline knowledge for females assigned at birth, there is no number of correct answers to assign a level of knowledge. The tool will evaluate knowledge at Time 1 and compare scores to Time 2 and Time 3 to assess for increased knowledge and retention.

The Champion's Health Belief Model Questionnaire assesses the patient's health beliefs toward susceptibility of disease, benefits of action, and perceived barriers related to breast health. The original Champion's Health Belief Model was created by Victoria Champion in 1993. This questionnaire contained 42 items within 7 concepts (Champion, 1993). The concepts are:

susceptibility, seriousness, BSE benefits, BSE barriers, confidence in BSE efficacy, health

motivation, mammography benefits, and mammography barriers (Champion, 1993). The short-

form was developed by choosing 28 questions of the 42 original questions based upon their

influence of the mean score of each concept (Appendix 3) (Saadat et al., 2016). Cronbach's

alpha was determined for this revised scale as 0.79 for the susceptibility section, 0.68 for the

severity section, 0.80 for the benefits, 0.63 for the barriers, 0.83 for self-efficacy, 0.75 for health

status, 0.73 for mammogram benefits, and 0.62 for mammogram barriers. This questionnaire

utilized a 5-point Likert scale ranging from 1-strongly disagree to 5-strongly agree (Saadat et al.,

2016).

The Usability of the Website is a self-designed questionnaire with the intention of

assessing ease of use of the multi-media intervention for the participants. It will also collect data

regarding how much time the participants spent on the website. This questionnaire consists of

eight items related to the accessibility and ease of use by participants (Appendix 4). Answers for

this tool include "yes" or "no" for each statement provided. The researchers will evaluate if

there is a correlation between the participants visiting the website more than once and breast

health knowledge, retention, and self-efficacy with BSE. There are no "correct" answers to this

questionnaire.

Table 1 Schedule of Questionnaire delivery

	Demographic Survey Appendix 1	Champions Health Belief Model Appendix 2	Breast Health Assessment Appendix 3	Usability of Website Appendix 4
Time 1: In-Person Visit	X	X	X	
Time 2: One Month		X	X	

Time 3: Two Month		X	X	X

Interim Analysis

The proposed sample for this study was based on a statistical power analysis performed for sample size estimation. For the primary aims of increasing participants' knowledge about breast health and increasing participants' self-efficacy in performing self-breast examinations, an effect d of 0.5 was used in the a priori power calculation, the difference between two dependent means, alpha = .05 and power = 0.80, the analysis was completed with G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). The projected sample size needed with this effect size is N =54. An expected attrition rate between baseline and follow-up is 50%. Therefore, we will consent to up to 108 participants.

Each statistical test was conducted at p=.05 level. Descriptive statistics were used for the demographic, independent, and outcome variables. The primary aims of increasing participants' knowledge about breast health and self-efficacy in performing self-breast examinations were analyzed with a paired t-test between pre- and post-knowledge and self-efficacy. Additional analysis will include differences between demographic factors and the outcome variables. Relationships between demographic variables and outcomes will be assessed with correlational and chi-square methods, as appropriate.

Results

According to the Demographic Survey, majority of participants are Caucasian, and college educated (Table 2). Of the participants, 29% resided in a rural location and 71% lived in an urban area. Thirty-four percent of the participants are currently taking oral contraceptives or hormone replacement therapy. Eighteen percent had a personal history of breast disease and 45% had a family history of breast cancer. Majority of participants have not had a history of breast surgeries (breast enhancement, lumpectomy, or removal of breast tissue). Ninety-three percent

have been educated about how to perform a BSE at some point in their life and 85% of participants feel that the education they have received regarding BSE has met their needs. A total of N=62 was enrolled at Time 1 and eighteen of those participants have completed the BHA, while twenty-four have completed the CHBM.

At this point in the study, there is improvement of knowledge regarding the subscale of "breast cancer signs and symptoms" from the BHA (p=.024, d=.58) (Table 3). An increase in knowledge regarding abnormal signs and symptoms of the breast can lead to earlier detection of cancers or benign diseases thus leading to earlier treatment options. Another finding from the BHA includes a slight score improvement regarding the "breast risk factors" subscale from 2.50 to 2.78. One month into the study, the "breast self-exam knowledge" subscale has decreased from 3.83 to 3.61. Overall, the total score for the BHA has not shown any significant changes from 9.00 at the pre-test to 9.56 at the post-test.

The CHBM did show improvement in some of the subscales (Table 4). The score related to "susceptibility" improved from 2.04 to 2.23 and the" seriousness" subscale went from 3.65 to 3.67. "BSE benefits" of the CHBM went from 3.31 at the pre-test to 3.36 at the post test. The "BSE barriers" subscale score improved from 1.95 to 2.11, but the subscale for "motivation" declined from 3.73 to 3.51. Finally, "mammography benefits" declined in score from 3.80 to 3.48, but the "mammography barriers" improved from 1.59 to 1.76. The total score for the CHBM has not shown any improvement currently from 79.09 at the pre-test to 78.65 at the post-test.

Currently, N=18 have finished the BHA and N=24 participants that have finished the CHBM at Time 2 (one month post-test), with an expected N=54 participants needed to have full power. With an increase in patient compliance, more data will be assessed to see if an

educational website has improved the participants' breast health knowledge and self-efficacy of BSE. We will also have more data to assess if the website was user-friendly and easy to understand after the participants have completed the Usability of Website questionnaire at Time 3.

Discussion

Summary

Clinical breast exams (CBE) are becoming less common due to the changes to standard practice, which could lead to missed diagnoses and decreased quality of life. Currently, 2021 ACOG Practice Guidelines changed from *mandatory* to *optional* provider-performed clinical breast examinations (ACOG, 2021). The use of an evidence-based educational website could help improve breast knowledge, self-efficacy of BSE and reach a wider population of females. This tool also incorporates all learning styles, such as visual, auditory, kinesthetic, and reading/writing. During the interim analysis, it is difficult to assess if participants have improved breast health knowledge and self-efficacy of BSE, because of increased attrition rates. Increased participation and continued evaluation using these questionnaires will further determine the value of the educational website.

Limitations

Limitations to this interim study include the lack of scripted education provided to the participants at Time 1. This could have improved engagement throughout the study and ensure that all participants would have had education provided to them during at least one point in the study. Also, the length of between Time 1 and Time 2 (currently one month) should have been shortened to one week to help improve retention of participants. During the interim analysis, increased attrition may be attributed to the length of time between Time 1 and Time 2. Participants were also limited to the state of Nebraska. Separate emails were provided to

participants at Time 1 that each contained one of the questionnaires. This could have caused participants to submit only one of the questionnaires and forget to take the other, since they were provided in individual emails. Finally, a limitation to this interim analysis included participant self-reporting about breast health knowledge and self-efficacy of BSE through the BHA and CHBM.

Recommendations

Multiple recommendations were assessed for future research. The first recommendation for improvement on this study would have been to provide scripted, face-to-face education to participants at Time 1. This would have ensured that participants had received evidence-based education at one point in the study. It is possible that some participants never viewed the website, thus the reason for the lack of increase of breast health knowledge and self-efficacy of BSE. Another recommendation would have been to send weekly "video boosters" to the participants to 1) remind them to view the website and 2) provide education on a consistent basis.

Participants have been inconsistent with answering both questionnaires (BHA and CHBM) at Time 2. A recommendation for future research would be to shorten the length of time between Time 1 and Time 2 to one week. Currently, this project has one month between Time 1 and Time 2. Sending the questionnaires to participants after one week from the initial visit may have increased compliance. It is also possible that participants are forgetting about the questionnaires after one month or participants forgot about the website during the one-month period, thus affecting their scores regarding breast health knowledge and self-efficacy of BSE. Shortening the length of time to one week between Time 1 and Time 2 may have decreased attrition rates as well. A final recommendation found was to provide both questionnaires in the same email at Time 2, may also help improve attrition rates.

Conclusion

The study is currently ongoing. Continued data collection and assessing results at Time 3 will help determine if the use of an educational website improved breast health knowledge and self-efficacy of BSE. Currently, data has shown improvement in knowledge with breast cancer signs and symptoms and self-efficacy related to mammography barriers. All other subscales of both questionnaires have not shown statistical significance. Increased attrition and lack of face-to-face education provided at Time 1 were limitations to this interim analysis and should be considered for future studies. The use of an educational website to improve breast health awareness to females of all ages may allow for easier access to evidence-based information, increased breast health knowledge, and improved self-efficacy of BSE leading to earlier detection of breast disease.

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Appendices

Appendix 1
<u>Demographic Survey</u>
1. What is your age? _____

2. What is your ethnicity/race?
    A. Indian/Alaskan
    B. Asian
    C. Black
    D. Hispanic/Latino
    E. White
    F. Unknown

3. What is your marital status?
    A. Married
    B. Single
    C. Divorced
    D. Widowed
    E. Separated

4. Highest level of education:
    A. Some High School
    B. High school diploma/GED
    C. Associate's degree
    D. Bachelor's degree
    E. Master's degree
    F. Doctorate degree

5. What best describes where you reside?
    A. Country/Rural
    B. City/Urban

6. Do you have a family history of breast cancer?
    A. Yes
    B. No
    C. Unsure

7. How would you describe your history with tobacco (smoking, vaping, chewing)?
    A. Never used
    B. Past use
    C. Current use

8. Have you ever had any breast health problems (lumps, discharge, skin changes)?
   A. Yes
   B. No
   C. Unsure

9. Have you ever had any of the following surgeries?
   A. Breast enhancement
   B. Breast Reduction
   C. Lump removal
   D. Removal of breast tissue
   E. None

10. How many times have you been pregnant? _____

11. Are you currently on any hormones?
   A. Yes
   B. No
If yes, what is your current hormonal treatment? _____

12. What best describes your current menstrual cycle?
   A. Occurs monthly
   B. Occurs irregularly
   C. Absent

13. Have you experienced symptoms of menopause (night sweats, hot flashes, irregular periods, breast sensitivity, irritability)?
   A. Yes
   B. No

14. Have you ever been educated about how to perform a breast self-examination?
   A. Yes
   B. No
If yes to question 14, do you feel the education on breast self-examination met your needs?
   A. Yes
   B. No

Appendix 2
Champions Health Belief Model Scale
  1- Strongly disagree to 5-strongly agree

Champions Health Belief Model					
Susceptibility					
1. It is likely that I will get breast cancer.	1	2	3	4	5
2. My chances of getting breast cancer in the next few years are great.	1	2	3	4	5
Seriousness					
1. The thought of breast cancer scares me.	1	2	3	4	5
2. If someone had breast cancer, her whole life would change.	1	2	3	4	5
Breast Self- Exam (BSE) Benefits					
1. When I do self-examination, I feel self-satisfied.	1	2	3	4	5
2. When I complete monthly breast self-examinations (BSE), I don't worry as much about breast cancer.	1	2	3	4	5
3. Completing BSEs each month may decrease my chances of dying of breast cancer.	1	2	3	4	5
Breast Self-Exam (BSE) Barriers					
1. Doing breast examination will make me worry about what is wrong with my breast.	1	2	3	4	5
2. BSE takes too much time.	1	2	3	4	5
3. It is hard to remember to do breast examinations.	1	2	3	4	5
4. BSE is not necessary if you have a routine mammogram.	1	2	3	4	5
Confidence in BSE Efficacy					
1. I could find a breast lump by performing a BSE.	1	2	3	4	5
2. I am able to tell if something is wrong with my breast when I look in the mirror.	1	2	3	4	5
3. I can perform BSE correctly.	1	2	3	4	5
Health Motivation					
1. I exercise at least 3 times a week.	1	2	3	4	5
2. I eat well-balanced meals.	1	2	3	4	5
3. I have regular checkups even when I am not sick.	1	2	3	4	5
4. Maintaining good health is extremely important to me.	1	2	3	4	5
Mammography Benefits					
1. If I find a lump through a mammogram, my treatment for breast cancer may not be as bad.	1	2	3	4	5
2. Having a mammogram is the best way for me to find a very small lump.	1	2	3	4	5
3. Having mammogram will decrease my chances of dying from breast cancer.	1	2	3	4	5
4. When I get a recommended mammogram, I feel self-satisfied.	1	2	3	4	5

Mammography Barriers					
1. I have other problems more important than getting a mammogram.	1	2	3	4	5
2. Having a mammogram is too painful.	1	2	3	4	5
3. I don't know how to go about getting a mammogram.	1	2	3	4	5
4. I am too old to need a routine mammogram.	1	2	3	4	5
5. Having a mammogram is too embarrassing.	1	2	3	4	5
6. Having a mammogram takes too much time.	1	2	3	4	5

Appendix 3
Breast Health Assessment

Breast Cancer Signs and Symptoms	Agree	Disagree	Unsure
1. Breast self-exam should be performed every month on the same day.		x	
2. A lump in the breast is always indicative of breast cancer.		x	
3. Changes in skin texture is a finding that requires further assessment by a provider.	x		
4. Having one breast be a different size than the other always requires further evaluation by a provider.		x	
5. If not currently breastfeeding or pregnant, nipple drainage requires further evaluation by a provider.	x		
Breast Cancer Risk			
1. Having a family member with breast cancer increases my risk of developing breast cancer.	x		
2. The older I become, the higher risk of being diagnosed with breast cancer.	x		
3. Having previous breast surgeries does not put me at higher risk of developing breast cancer.		x	
4. The BRCA1 or BRCA2 gene means that there is a higher risk of developing breast cancer.	x		
5. The age at which I first had my period does not affect my risk of developing breast cancer.		x	
Breast Self-Exam Knowledge			
1. I do not need to feel around my nipple, because there are no signs of breast cancer in this area.		x	
2. It will take me at least 5 minutes to perform a SBE correctly.	x		
3. I don't start performing a BSE until I am 30 years old.		x	

|	X		
4. I need to use the pads of my pointer and middle fingers when performing a BSE.	X		
5. I only feel around my breast when I am performing a BSE.		X	

Appendix 4
Website Usability Questionnaire

Website Usability	Yes	No
The website is easy to use.		
The information was easy to understand		
The QR code took me to the website without difficulty		
I visted the website at least one time		
I visited the website more than one time		
I spent less than 20 minutes collectively on the website		
I spent 21-60 minutes collectively on the website		
I spent over 60 minutes collectively on the website		

Table 2. Demographic Survey Results (N=62)

Age (>18)	Mean=44	SD=12.7
Ethnicity		
Caucasian	58	93.5%
Asian	1	1.6%
Black	3	4.8%
Education		
High School/GED	18	29%
College Educated	44	71%
Hormone Use		
Hormone Contraception or HRT	21	33.9%
None	41	66.1%
Personal History of Breast Disease		
Yes	11	17.7%
No	51	82.3%
Family History of Breast Cancer		
Yes	28	45.2%
No	28	45.2%
Unsure	6	9.7%

Table 3. Breast Health Assessment Subscales Pre/Post Test (N=18)
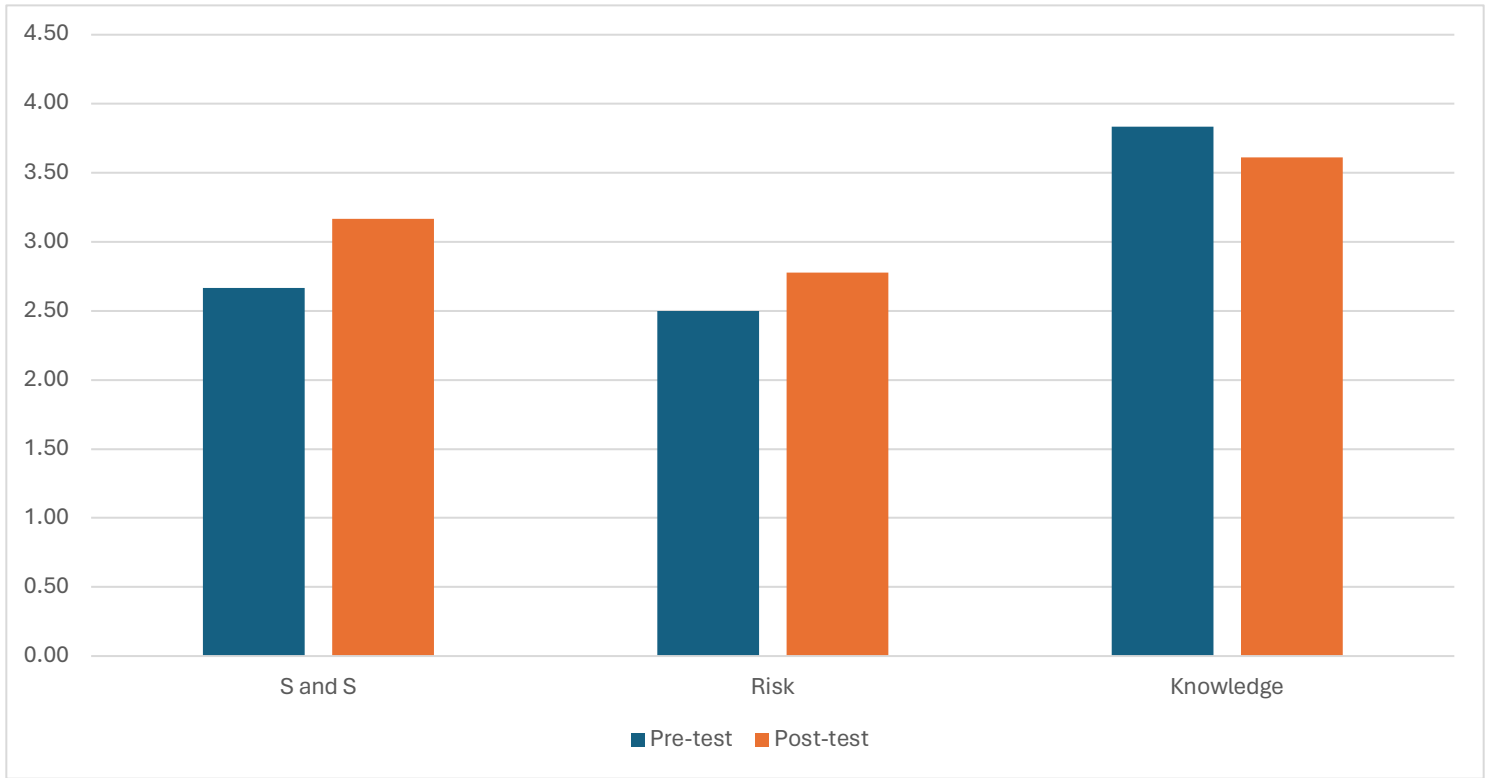
Table 4. Champions Health Belief Subscales Pre/Post Test (N=23-24)