Educating Rural Women about Gender Specific Heart Attack and Prodromal Symptoms

Melanie B. Kalman, RN, PhD [1]

Margaret Wells, RN, PhD, ANP-BC [2]

Pamela Stewart Fahs, RN, PhD [3]

[1] Professor, Upstate Medical University, College of Nursing, kalmanm@upstate.edu

[2] Professor, Lemoyne College, wellsmm@lemoyne.edu

[3] Associate Dean ; PhD Program Director ; Professor & Dr. G. Clifford and Florence B. Decker Chair in Rural Nursing, Decker School of Nursing, Binghamton University, psfahs@binghamton.edu

Abstract

Problem: Heart Disease (HD) remains the leading cause of mortality among women. Improvement of outcomes for morbidity and mortality in females with HD has not occurred at the same rate as in males. Rural populations often have more barriers to seeking timely intervention than their urban counterparts.

Purpose: To test the efficacy of using acronyms to educate rural women on female MI and prodromal symptoms as well as the appropriate response to these symptoms and to assess if knowledge gained was sustained for a 2-month period of time.

Method: A quasi-experimental design with two groups with site randomization of educational intervention with N = 137 rural women (RUCC codes of 5 or higher). Factor analysis, validity and reliability testing for the 23 item Matters of Your Heart Scale (v. 2) are discussed.

Findings: Comparing the two educational formats of acronym vs. no acronym showed no statistically significant difference on the Knowledge score t = .26, df = 134, p = .80 by group. Similar non-significant findings occurred for the major subscales. Some demographic groups did achieve significantly higher scores on the MOYH v. 2. A multiple regression indicated that the final model explained 90% of the variance in the dependent variable of Knowledge of female MI symptoms including the appropriate response to those symptoms (R^2 = .90, $adjR^2$, se = **1.65).**

Conclusions: Educating rural women to recognize gender specific heart attacks symptoms, possible warning symptoms, and the need to respond appropriately is an area where rural nurses can make a difference whether or not an acronym educational approach is used.

Keywords: Female, heart disease, MI, acronym, heart attack, rural

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Heart Disease (HD) remains the leading cause of mortality among women and is estimated to affect nearly one in two women, and one quarter of all deaths in the United States (US) are from HD (National Institutes of Health, U.S., n.d.). There is debate about the relationships of rurality and the incidence of cardiovascular disease (CVD), myocardial infarction (MI), and mortality rates. The existence of a phenomena of non-metropolitan mortality penalty has been previously reported and all-cause mortality has been found to continue to be higher in non-metropolitan places compared to those identified as metropolitan (James, 2014).

There are multiple systems used to delineate metropolitan versus non-metropolitan areas of the US. The 2013 Rural-Urban Continuum Codes (RUCC) is one of the most widely used (United

States Department of Agriculture [USDA], n.d.). This is a county-based classification system with nine levels of which levels 1 – 3 are considered metropolitan. The coding for RUCC 4 - 9 is non-metropolitan. The RUCC considers not only population but also the amount of urbanization, and whether a county is adjacent or non-adjacent to metropolitan counties (USDA, ERS, n.d.). However, variances in mortality occur even within those communities considered non-metropolitan. James (2014) found that those living in RUCC counties coded as 6 have the highest mortality penalty compared to a more favorable finding for those in the rural counties with RUCC codes of 9. Whether there are risks in rural living that potentiate CVD, MI, and /or mortality disparities, it is clear that all women, including those who are rural dwellers have increased risk of heart attack as they age.

A previous study including rural and urban women explored the effectiveness of an educational program based an instrument to test women's knowledge of MI symptoms learned in the program (Kalman, et al., 2013). The educational program was organized around two acronyms for gender specific prodromal and MI symptoms and the need to call emergency services if symptoms occur. The term" heart attack" rather than MI was used in the educational program since it is the term most frequently used by non-medical personnel. For acute MI symptoms, the acronym CURBS was used to highlight **c**hest sensation or pain, **u**nusual fatigue, **r**adiating pain to back jaw or arm, **b**reathing difficulties, and **s**weating. The acronym FACTSS stands for **f**atigue, **a**nxiety, **c**hest discomfort, **t**ummy (indigestion), **s**hortness of breath, and **s**leeping difficulties, which have been identified as prodromal symptoms of MI in women (McSweeney et al., 2003; Morgan, 2005). The acronym FACTSS is 'misspelled' intentionally to stress the point of utilizing a mnemonic or acronym to remember a collection of symptoms. Women's knowledge about MI symptoms increased after the intervention (Kalman, et al., 2013). Because the study used a one group only, pre-test, post-test design, a follow-up study was needed to determine if the use of an acronym-based intervention was effective in increasing knowledge or if this was simply a treatment effect. The purpose of the current study was to test the efficacy of using acronyms to educate rural women on female MI and prodromal symptoms as well as the appropriate response to these symptoms. An additional purpose was to test if the knowledge was sustained over two months. Finally, the instrument underwent further refinement and validity testing.

Literature Review

Despite significant improvements in the management of heart disease once a patient is hospitalized, little gain has been made in the pre-hospital delay times with patient decisions having the most significant impact on delayed time to treatment. While delay time is important with both genders, women had a significantly increased delay time compared to men (Ladwig, et al. 2017). MI symptoms in older women often differ from those in men and may be vague in nature such as fatigue, nausea, and shortness of breath. These vague and atypical symptoms have been found to attribute to older women's delay in seeking treatment (Ladwig, et al., 2017). In addition, women often experience prodromal symptoms six months to one year prior to having an MI which further adds to dismissal of symptoms (McSweeney & Coon, 2004). Albarqouni, et al., (2016) found that even with knowledge of symptoms women delayed longer in getting to the hospital than men with knowledge. Timely treatment is important since prompt intervention can reduce MI mortality and morbidity rates (Nguyen, Saczynski, Gore, & Goldberg, 2010). Mortality rates for women with MI are higher than those for men, possibly because women are not recognizing the symptoms of MI and, therefore, do not seek timely emergency treatment (Izadnegahdar et al., 2014).

Several public health campaigns have been initiated to raise awareness of women and health disease such as the American Heart Association initiative called Go Red for Women, the National Heart, Lung, Blood Institute of the National Institutes of Health campaign called the Heart Truth, and the Department of Health and Human Services Office of Women's Health initiative called Make the Call, Don't Miss a Beat (Mosca, et al., 2013). While these campaigns have demonstrated some success, more interventions are needed to improve awareness (Mosca, et al., 2013). McDonald, et al. (2006) found that a storytelling versus factual format did not make a difference in women's knowledge about MI symptoms; however, both groups added to their knowledge of MI symptoms. In women who had been previously hospitalized for an MI, group sessions that allowed for development of connections and sharing of experiences, fears, and concerns, enhanced knowledge about MI symptoms and the need to call 911 if the symptoms occur (Perry & Rosenfeld, 2005). Older women were the less knowledgeable about these symptoms (Albarqouni et al., 2016). Interventions to educate about MI symptoms, particularly atypical symptoms, should be targeted to older women. Before women can respond appropriately, they need to have knowledge about MI symptoms and timely, safe ways to respond if they are experiencing these symptoms.

Long and Weinert (1989) identified key concepts pertinent to rural populations, and these include health beliefs, self-reliance, isolation, and distance. While these concepts were not directly measured in this study of rural women, they do relate to the issue of rural women seeking medical care for MI symptoms with an appropriate response of calling Emergency Medical Services (EMS) 911. Health to rural women often means that they identify as needing to be functional to carry out their roles (Lee & Winters, 2004). This is related to their feelings of self-reliance and the ability to continue to care for others, at times putting the care of others above care of self. Women, including those who live in rural areas may delay seeking treatment when experiencing MI symptoms. While there may be many predictors for the delay, including possible lack of awareness of what female MI symptoms; rural nursing theory (RNT) highlights the influence of cultural components such as the perception of health that focuses on functionality, the need for self-reliance and desire to care for others. Isolation and distance, lack of access, and tendency to rely on lay networks versus professional assistance are also factors in seeking professional health care (Lee, Winters, Boland, Raph, & Buehler, 2018; Montgomery, Sutton, & Paré, 2017). Rural women often have further distance to travel, poorer roads or seasonal conditions that can delay or lengthen travel times, and rural communities are more likely to rely on volunteer EMS systems. Healthcare facilities are often a great distance away and rural women might dismiss vague symptoms as insignificant and not worth the travel.

Poverty is an important issue in rural populations. According to Bolin et al., poverty rates are higher in rural areas compared to urban areas (2015). However, poverty is not the only issue for rural dwellers. Lack of access and limitations in access to care, frequently seen in rural communities are further compounded for those in poverty (Fahs, 2017). More resources may be needed to access care, particularly specialty care, in rural communities and poverty only heightens the issue. Rural dwellers living in poverty are less likely to have means of reliable transportation and resources to cover the cost of seeking care within the area, much less the additional cost associated with seeking care beyond the rural community.

Methods

Design

The design used was quasi-experimental with two groups and site randomization. The research questions were: 1. What is the effect of the use of an acronym-based educational intervention on knowledge of female heart attack and prodromal symptoms as well as appropriate response to these symptoms among rural women? 2. What is the effect of the program on knowledge at two-months after the initial presentation?

Sample & Setting

Institutional Review Board (IRB) approval was obtained from Upstate Medical University (IRB exemption) and Binghamton University (1985-12) before recruitment. Female subjects were recruited by contacting rural community groups located in churches and agencies. In addition, fliers were posted at local sites. Eligibility criteria for this study included women over 18 years of age who reside in rural areas (RUCC code 5 or higher). All subjects had to be able to speak and read English. A power analysis indicated a sample size of at least 128 would be needed to assure power to find a statistically-significant difference between two groups in an independent t-test p = .80, alpha = .05. Prior to the presentation a site was randomly assigned to the control or experimental treatment group. Design contamination between control and experimental participants was the concern that led to the decision to randomize sites, not subjects (Macha & McDonough, 2011). The education was presented in 18 sites including community centers, church basements, schools, and an education center in a Critical Access Hospital. Consent was obtained on the day of the presentation but prior to beginning the presentation. This sample included N =

136 rural women for the immediate posttest measures. The sample size dropped to n = 75 for the 2 – month follow-up testing.

Instrument

The Matters of Your Heart Scale version 2 (MOYH v. 2) was refined based on an initial instrument that had 26-items and validity and reliability as previously described (Kalman, et al., 2013). The original version was developed and tested with rural and urban women. Revisions included additional distractors that had similar first letter response so that identify letters for first words in the acronym would not queue the respondent to the correct answer (e.g. **S**weating and **S**welling).

Instrument items had a possible three-point Likert scale response (very uncommon, common, or very common or strongly disagree, agree or strongly agree). The questionnaire was identified as usable as long as there were no more than 5 responses missing on the initial 37 items. A score of 0 was imputed if no answer was marked.

The current MOYH v. 2 was ultimately reduced to 23 items through a factor analysis with principal axis factoring and Varimax rotation, producing a Kaiser-Meyer-Olkin (KMO) of sampling adequacy of .78. Scree plot and eigenvalues both affirmed the 6 subscales within the instrument (Field, 2018). In the final rotation, 53% of the variance of outcomes was explained by this instrument. A factor analysis is often used to address content validity in instrument development and testing. When the items come together to form factors, they should relate conceptually to other items within that factor and pertain to the concepts being addressed. The items in each of the six subscales were clearly related to each other and the concepts within the intervention. For example, the CURBS scale had items on chest discomfort, unusual fatigue, shortness of breath and sweating.

The next step was to test the instrument and subscales for reliability. The Cronbach Alpha on standardized items of the knowledge scale equaled .88 which is indicative of good reliability. Subsequent reliability testing of subscales on the CURBS and FACTSS acronyms, the likelihood of women experiencing symptoms, and a subscale on location of symptoms such as jaw/neck, chest and arm had acceptable Cronbach Alpha scores ranging from .80 to .85. Two subscales did not have appropriate reliably and were discarded. Thus the 4 subscales were also used in the analysis. After the factor analysis, the total knowledge score on the MOYH v. 2 had a possible range of 0 - 23 points. The CURBS subscale included 6 items with possible range from 0 to 18, and focused on the MI symptoms of chest sensation, unusual fatigue, breathing problems and sweating. The FACTSS subscale contained 5 items with a possible score of 0 - 15 and focused on prodromal MI symptoms. A third subscale had questions that explored the likelihood of women experiencing symptoms and included 4 items with potential scores from 0 – 12, and the final subscale on location of symptoms such as chest, jaw etc. ranged from a possible 0 to 9 points with 3 items. Higher numbers indicated more knowledge on all portions of the instrument. The factor analysis was conducted to assess construct validity of the instrument and the output indicated there was strong construct validity. Good reliability (a = .80 - .88) of the knowledge scale and each of the four retained subscales was found through conducting Cronbach Alpha. Item test – retest reliability was not calculated. The instrument is available upon request.

Procedure

In the experimental group sites, the information on female MI and prodromal symptoms was presented using two acronyms, CURBS and FACTSS, to improve uptake and retention of knowledge. The control group received the same information as the experimental group. However, control group presentations did not include the acronyms but presented the information with symptoms in alphabetical order. Prior to the presentation, participants were asked to complete a brief demographic questionnaire that included yes / no questions regarding medical history, age, educational level, ethnicity and zip code. One of the principal investigators (PI) delivered all programs using a PowerPoint presentation and a specific script on speaker notes. The pre-developed and rehearsed scripts for both the presentations were an effort to establish intervention fidelity. When the program concluded, the first posttest was completed. For the two-month follow-up, the same posttest questionnaire was mailed to the subject. The posttest included the subject's study unique ID number to allow linking of immediate posttest and two-month follow-up questionnaires.

Data Collection

Upon entering the site of the presentation each woman received a pretest booklet that consisted of demographic questions and a posttest questionnaire that were color coded to queue the participant as to which booklet to complete before and after the presentation. They also received a copy of the slides to be presented in that session (depending on randomized site, either using the acronym or alphabetical format). Each participant received a pre-stamped envelope the day of the presentation to self-address. At the beginning of each of the 14 presentations, subject rights were presented in verbal, visual, and written form. The women were notified that turning in their post presentation questionnaire served as informed consent for participation in the initial part of the study and returning the self-addressed envelope, would allow us to contact them with the 2-month follow-up questionnaire. Returning the final questionnaire would provide consent for participation in that portion of the study. The women in the control and experimental groups received the same instrument for their posttest and 2-month follow-up.

Findings

Descriptive Analysis of Sample

One hundred and thirty-six women (N = 136) attending the presentations provided posttest usable data. Data were considered usable if no more than 5 responses were missing, zero was imputed for missing items. Data were analyzed using IBM SPSS Version 22. A total of 28 different zip codes were represented in this study. All women were living in a rural part of upstate New York or northeastern Pennsylvania with RUCC codes of 5 or higher, with the mode of a RUCC of 6 in this sample. The sample was primarily Caucasian (n = 127, 93%) reflecting the racial makeup of the rural areas where the study took place. Ages ranged from 25 to 90 years (M = 63.4, sd = 12.75), with a slight majority reporting their age as 64 years or younger (n = 70, 51%). Only 4.5% reported less than a high school education or a Graduate Equivalency Degree (GED). The most often reported educational levels included categories of less than a high school education through some college (n = 70, 51%).

Immediate Post Presentation Findings

Comparing the two educational formats of acronym vs. no acronym, an independent t-test was computed and indicated there was no statistically significant difference on the Knowledge score t = .26, df = 134, p = .80. The mean score for the group receiving the experimental treatment of a presentation using the acronyms was 15.19 points (*sd* = 5.36) out of a possible 23 points vs. a mean of 14.96 (*sd* = 5.13) for the group receiving the same information without the use of acronyms. Similar non-significant results were found on both the CURBS (t = -.54, df = 134, p = .59) and FACTSS subscales (t = -.95, df = 134, p = .34) with means of 2.97 (*sd* 1.86) and M = 3.80 (*sd* = 2.30) respectively.

Although being in the experimental vs. control group did not lead to significantly different scores on the Knowledge scale or the CURBS or FACTSS subscales, some demographic groups did achieve significantly higher scores in the statistical analysis (see Table 1). Age groupings were established using the cut point of 64 years or younger (n = 70) vs those 65 years of age and older (n = 64) based on the sample descriptive statistics. Similarly, educational grouping of less or more education were established using the cut point of some college or less vs. those with a 2-year degree or more based on demographic data. Other groupings such as by reported race (Caucasian vs. other and no report), self-report of history of CVD and self-reported medication use for those medications designed to treat hypertension (HTN) or hyperlipidemia were also used as independent variable groups for this analysis. None of the tests performed for demographic groupings reached statistical significance.

Table 1

Independent t-test Scores on Knowledge, CURBS and FACTSS by Demographic Groupings

Demographic	**Scale Grouping**	**Mean (SD)**	**Independent t-test t, df, p**
	Knowledge		
	Younger (≤ 64 years)	16.71 (4.36)	
Age			t = 4.11, df = 134, p = .000*
	Older (≥ 65 years)	13.22, (5.52)	
Education	Less Education (≤ some college)	14.27, (5.56)	t = - 2.00, df = 134, p = .047*

Demographic	Scale Grouping	Mean (SD)	Independent t-test t, df, p
	More Education (≥ 2-year degree)	16.05, (4.63)	
	CURBS		
Age	Younger (≤ 64 years)	15.46, (2.33)	*t* = 1.76, df = 134, *p* = .082
	Older (≥ 65 years)	14.67, (2.89)	
Education	Less Ed (≤ some college)	14.85, (2.78)	t = -1.16, df = 134, *p* = .13
	More Ed (≥ 2-year degree)	15.37, (2.42)	
	FACTSS		
Age	Younger (≤ 64 years)	13.40, (1.93)	t = 3.38, *df* = 134, *p* = .001*
	Older (≥ 65 years)	12.16, (2.48)	
Education	Less Ed (≤ some college)	12.53, (2.57)	t = -1.52, df = 134, *p* = .11
	More Ed (≥ 2-year degree)	13.13, (1.85)	

Follow-up at 2 Months

Just over half (n = 75, 55%) of the women chose to participate in the 2-month follow-up, returning the mailed questionnaire. Again, the data were deemed usable if no more than 5 responses were missing and in the case of missing data, 0 was imputed. As in the analysis of the immediate posttest results, being in the experimental acronym group did not significantly improve the 2- month follow-up scores on the knowledge or the CURBS or FACTSS subscales. In computing the independent t-test on 2-month follow-up scores by demographic groupings, only age and medication use had any influence on outcome scores. The younger age (≤64) group had statistically significant better scores on the 2-month follow-up on total knowledge (p = .005) and the FACTSS subscale (p = .006) but not the CURBS subscale (p = .12). These findings mirror those seen in the immediate post-test analysis. A finding that did differ from the immediate post-test results was the statistically significant difference in the CURBS 2-month follow-up by history of taking a medication (either for HTN or hyperlipidemia). In this analysis those taking a medication (*n* = 30, *M* = 15.37, *sd* = 2.25) as described above scored lower than those not taking medication (*n* = 45, *M* = 13.60, *sd* = 3.25) at the time of the presentation. The difference between the two groups was statistically significant only on the CURBS subscale (t (73) = 2.58, p = .01).

Factors Predicting Knowledge Female Heart Attack Symptoms

A backward stepwise regression was computed to identify what variables explained the most variance in outcomes. In addition to the main independent variable of experimental vs. control groups, eight other variables were used as potential predictor variables to identify if they had influenced significance in the factor analysis or in the inferential statistical analysis. The initial loading of 9 variables plus the constant provided 10 predictors in the model (Field, 2018). The number of predictors was reduced to 7 in the fourth and most robust model. In addition to the constant, the predictors in model 4 included the subscale of location of female symptoms; grouping of Caucasians vs. other or no answer; likelihood of women having specific symptoms, the CURBS and FACTS subscales. This model explained 90% of the variance in the dependent variable of Knowledge of female MI symptoms including the appropriate response to those symptoms (R = .95, R^2 = .90, $adjR^2$, se = 1.65). The adjusted R^2 indicates that there is good cross validity of the model (Field, 2018). Collinearity statistics of tolerance and variance inflation factor (VIF) were examined. All VIF in the model were below 10 and tolerance as well above .20 indicating there were no issues of multicollinearity for this model.

Limitations

The requirement to speak and read English reduces the generalizability of the findings. Also, the lack of a randomized sample of subjects as well as the intervention only attended by rural women from upstate New York or northern Pennsylvania limits the generalizability to the population of rural women. Attempts to correct for the lack of random sampling included the randomization of type of program by site. Site randomization was chosen because of previous reports of randomized subjects in rural communities sharing information and, thus, compromising the intervention (Fahs, et al., 2013).

Although the sample size was adequate for analysis of the immediate post-test information, the analysis of the 2-month follow-up data lacked power to rule out the possibility of a Type II error (Field, 2018). This study did not measure baseline knowledge of gender specific MI or prodromal symptoms. The decision to only compare groups on the measures immediately after the presentation and at the 2-month follow-up was made for two reasons. The ability of the program using an acronym format had been used successfully in the past to significantly increase Knowledge, CURBS and FACTSS scores (Kalman, et al., 2013). In not measuring pretest knowledge, limitations of time constraints and survey fatigue of the subjects were managed. Further testing of the MOYH v. 2 should include test-retest reliability.

Discussion

The acronym approach to educating rural women about gender specific heart attack and prodromal symptoms and how to respond appropriately did not result in a difference in knowledge scores on the main instrument nor the CURBS or FACTSS subscales. This finding would indicate that either approach (using acronyms or presenting symptoms alphabetically) are equally effective. Similar to the findings of McDonald and colleagues (2006), the delivery method of the content did not matter, but both groups had increased knowledge. During the educational programs, regardless of the delivery method, participants interacted with one another and shared stories, which might have affected their knowledge level. Perry and Rosenfeld (2005) found that group sessions where participants connected and shared experiences, fears, and concerns, increased knowledge about MI symptoms and the need to call 911 if the symptoms occur. Several factors need to be considered prior to completely rejecting the use of an acronym approach in providing rural women with knowledge on the issue. First, the acronyms used in this study may be too awkward to have a significant effect on remembrance of complicated symptoms that often present in women who are having a heart attack or experiencing warning signs of heart attack. Previous work has supported the use of acronyms in significantly improving knowledge of populations including those living in rural areas for issues such as stroke (Kalman, et al., 2013 a). As noted in the literature review (Albarqouni et al., 2016) older women in this study scored significantly worse on the outcome measures of knowledge as well as the prodromal symptoms represented in the FACTSS subscale. The difference in the outcome on the MI symptom subscale, CURBS, trended in the same direction with older women scoring lower but did not reach statistical significance (p = .08). Additionally, the one significant difference in the CURBS subscale score was for women taking medications to treat HTN or hyperlipidemia. Women on these medications scored lower on identification of symptoms of female heart attack, chest discomfort, unusual fatigue, radiating pain, breathing difficulties, and sweating. The interactions of age and the current use of medications was not examined in this analysis but is an area for further analysis.

This manuscript adds to the body of knowledge of nurses working with rural women on issues of gender specific MI and prodromal symptoms. The instrument continues to have strong validity and reliability data. A linear multiple regression produced a model that explained most of the variance (90%) seen in the outcome measures without multicollinearity.

Conclusion

In summary, rural women have no less risk of heart attacks and poor outcomes than those in metropolitan areas, although some rural population studies have indicated that there is unexplained variance in mortality in non-metropolitan populations. Women in this study were most often living in counties with a RUCC score of 6, the same level of rurality of counties indicated as having the highest non-metropolitan mortality penalty (James, 2014). The work reported here is not meant to argue rurality is a causal factor in gender specific female MIs, but rather that this study brings forth information important to rural women and thus adds to the knowledge of the discipline of nursing and others who work with rural dwellers. Too little research is conducted in rural populations and this study is designed to look specifically at rural women and their knowledge of gender specific MI symptoms and the appropriate response in utilizing the emergency services system (911) to gain immediate help in this medical emergency. Furthermore, the nurse designed program presented as part of this study served to alert women that early warning or prodromal symptoms often occur with increasing frequency, as reported by women who experienced a heart attack and survived (McSweeney et al., 2003). Rural nursing theory (RNT) informed the research team about cultural components of the rural sample (Long & Weinert, 1989) and prepared the nurses for questions or comments specific to rural dwellers that might arise; for example, the issue of length of time it would take EMS to respond in the community was occasionally mentioned as a possible rationale for not calling 911 for heart attack symptoms. Knowledge of RNT allowed the nurses to be prepared to provide data about average rural EMS length of response time and the dangers that could occur if relying on self or family/friends for transport.

Women need to be aware that prodromal symptoms must be taken seriously and that medical attention at that stage is potentially less expensive and may be effective in delaying or reducing the risk of a female heart attack. A primary role and responsibility of the nurse is to be at the forefront of health promotion, counseling, and education (ANA, n.d.). What better way to fulfill this mandate than by educating rural women regarding the recognition of female heart attacks, possible warning symptoms and the need to respond appropriately. Nurses can make a difference educating rural women about hear disease.

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