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Methicillin-resistant Staphylococcus aureus Education Effectiveness for Athletic Trainers at a University Community Physical Activity Center.

Afton Cope
East Tennessee State University

Methicillin-resistant Staphylococcus Aureus Education Effectiveness for Athletic Trainers at a University Community Physical Activity Center

Thesis submitted in partial fulfillment of the
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By

Afton D. Cope
College of Nursing/Honors College
East Tennessee State University

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Dr. Lisa Davenport, Faculty Mentor

Dr. April Stidham, Faculty Reader

Dr. Joy Wachs, Faculty Reader

Chapter 1: Introduction

Background

Methicillin-resistant staphyclococcus aureus (MRSA) is an aggressive bacterial infection that is resistant to most antibiotics used today. Like all bacterial infections, MRSA can be passed from person-to-person and over the past decade has made a big insurgence. According to the Centers for Disease Control and Prevention (2010), MRSA infections accounted for 59% of all soft tissue infections. Not only has MRSA become a significant problem in the healthcare setting, it has also created a problem among communities. When MRSA is acquired by healthy individuals who have not had a recent medical procedure it is referred to as community associated or CA-MRSA. One group that is very susceptible to this kind of MRSA is athletes and health club members because it is quite common for many people to touch the same equipment over and over throughout the day.

If equipment is not cleaned properly, bacteria and other germs carried by every person using that equipment remains present. The only way to prevent this problem is to ensure all equipment is cleaned after each use with the correct product to kill certain bacteria. In order to practice appropriate cleaning, staff must be trained and educated properly to know what products to use and when it is suitable to clean equipment. According to the Centers for Disease Control and Prevention (2010), the most effective way to prevent MRSA colonization on athletic equipment is to use EPA registered products in accordance with label instructions. The CDC also suggests that education regarding the following is necessary: 1) how the cleaner should be applied; 2) how the surface should be cleaned prior to disinfecting; 3) is it safe for a particular surface; 4) how long it must be left on a surface to kill pathogens; 5) should it be washed with water after use of cleaner and 6) dilution amounts to be effective against pathogens. Knowledge

on this important information is crucial to providing adequate disinfection. In this study, the aim is to determine if an education session could improve the hygiene practices of the employees at the Basler Center for Physical Activity (BCPA) on East Tennessee State University campus.

Statement of the Problem

Methicillin-resistant Staphylococcus aureus (MRSA) is a problem nationally and affects many people from all walks of life. Community associated MRSA is often ignored and not viewed as significant as Hospital Acquired MRSA, thus there is a lack of education on the topic. Without proper education on the topic, individuals are more at risk of acquiring an infection. One area that is at a particular risk for the transmission of Community Associated MRSA is physical activity centers. Additional education in these areas is important to improve community health and decrease the incidence of infection. Education could improve the knowledge of community acquired MRSA among employees at physical activity centers. The employees improved education can empower them to use better practices at work and also lead them to help educate clients that use the services at the physical activity center.

Research Questions

This research study began with the following questions:

1: What are the perceptions of BCPA employees about MRSA nationally?

2: Have BCPA employees been previously educated about MRSA?

3: Will educational power points increase the knowledge of BCPA staff?

4: What are hygiene and cleaning practices of BCPA staff and does that change with education?

The research questions led to examining the perceptions of BCPA staff before and after education. The intent is to assess if education has been previously given to determine if

education is common practice in the physical activity center. Also, the purpose of the study is to analyze if the provision of education improved the knowledge of the BCPA staff and if it changed their hygiene practices.

Assumptions

The assumptions in this study are that all participants will take the time to answer the questions given in the survey about their perceptions, opinions, and practices to the best of their abilities. This will ensure that accurate data is collected and represents the population. Another assumption is that community associated MRSA is a problem at the BCPA since it has been found in many other physical activity centers nationally. Also, it is assumed that BCPA staff is in need of education on the topic of MRSA. The participants in this study are all assumed to have similar roles in the BCPA. Lastly, it is assumed that the BCPA staff, that consists of students at East Tennessee State University will have varying opinions before and after education and that education will be beneficial.

Definitions

The definitions that apply to this study are as follows:

Methicillin-resistant Staphylococcus aureus (MRSA): MRSA is a staphylococcal bacteria that is resistant to certain common antibiotics used today. Those antibiotics include methicillin, oxacillin, penicillin, and amoxicillin. (Centers for Disease Control and Prevention, 2013)

Community Associated MRSA: MRSA that is contracted in a healthy individual that has not been recently hospitalized. This kind of MRSA is commonly found in the community in areas that are used by many people. An example is MRSA that is contracted in a skin wound from a piece of equipment at the gym. (Centers for Disease Control and Prevention, 2013)

Hospital Acquired MRSA: MRSA that is contracted while hospitalized. These strains are usually more deadly and more common. An example is a MRSA infection in a surgical wound that was colonized before the patient was discharged. (Centers for Disease Control and Prevention, 2013)

Pathogens: A bacterium, virus, or other microorganism that causes disease. (Merriam-Webster Dictionary Online, 2013)

Disinfection: Any treatment used to destroy microorganisms. (Centers for Disease Control and Prevention, 2013)

Transmission: Is the passing of a communicable disease from one infected individual into another. (Centers for Disease Control and Prevention, 2013)

Hygiene: Practices used to become or continue to promote health and prevent disease. (Merriam-Webster Dictionary Online, 2013)

Overview of the study

In this study the employees at the BCPA were given a survey that was used as a pre and a post test. The pretest was given before the educational session, in order to determine previous knowledge. After the participants finished the pre survey they were given an educational presentation using power point. After the power point presentation participants completed the post-test. The goal of the study was to determine the knowledge level of the BCPA staff and their pre education hygiene practices as well as to determine the effectiveness of education in increasing participant awareness and understanding.

Chapter 2: Review of the Literature

Community acquired MRSA

When defining community associated MRSA (CA-MRSA), there are several studies that reveal what it is and how it is classified. Stanforth, Krause, Starkey, Ryan (2010) suggest, "Community associated MRSA is a strain of MRSA acquired by those who have not been hospitalized or undergone a medical procedure within the past year" (p. 12). The study was conducted in nine rural Ohio high schools' wrestling and athletic facilities, with all schools having at least one positive MRSA culture. In that study, CA-MRSA presence in athletic facilities was the focus and main concern; however, cleaning practices were not analyzed or observed within the nine schools.

Hostetter, Lux, Shelley, Drummond, Laguna (2011) suggests the international definition of CA-MRSA, includes the following criteria:

> An athlete a) is in an outpatient setting; b) has no history of previous MRSA infections; c) has no history of hospitalization, nursing home, skilled nursing facility, or hospice in the last year; d) has no history of dialysis or surgery in the past year; e) has no permanent indwelling catheter or medical device through the skin; f) is an otherwise healthy individual (p. 18).

This definition of MRSA is frequently cited and applied when deciding what groups to study and what areas to test for CA-MRSA. A study done by Hostetter et al. (2011) was conducted in seven high schools' athletic facilities and locker rooms, in which nine surfaces were tested for the presence of MRSA. The results of the study concluded that each high school had positive MRSA cultures in their athletic training rooms and locker rooms. The study analyzed the cleaning

products and cleaning schedules used in the different high schools. A conclusion of that study is a need for more effective cleaning products and cleaning schedules.

At Risk Groups

Another important component in previous studies is determining and revealing at risk groups for CA-MRSA. K. Hostetter et al. (2011) states, "Most CA-MRSA cases are reported in athletes with immunocompetence" (p. 18). Immunocompetence in this study refers to the fact that the student could possibly have immune systems that are weaker because of another health condition. This in return could cause them to be more susceptible to CA-MRSA. Another study by Baldwin, Eberman, Gilmore, Kahanov, Roberts, Semerjian (2011) supported this finding stating, "Athletes and athletic staff are particularly exposed and affected by CA-MRSA, with MRSA infections occurring at all levels of physical activity across the U.S. and abroad" (p. 415). As a result, athletes, athletic training staff, and members of physical activity centers are a possible at-risk susceptible population.

A study conducted by Baldwin et al. was conducted using a survey that was given to 163 athletic trainers from varying National Collegiate Athletic Association (NCAA) schools. The survey determined the athletic trainers' perceptions of their experiences, knowledge, and cleaning habits in relation to MRSA. The study revealed varying perceptions based on athletic trainers' gender, experience, and knowledge. In this study 92% of participants agreed that MRSA was a national problem, but there were varying opinions as to if it was a problem in their practice setting. The study also concluded a need for education about proper evidence based guidelines that need to be implemented. It was concluded that participants were having difficulty identifying which disinfectants were effective against MRSA, with over half not sure whether Formula 409 or Viruguard were effective. To further elaborate, Hostetter et. al (2011) reveals,

"The risk factors for MRSA apply directly to the athletic training setting and have the potential to increase the prevalence of CA-MRSA" (p. 19). This indicates the need to educate these populations and thus the need to educate and assess the members of the BCPA staff in this study.

When examining the at risk population, the question of transmission comes to mind. A study by Hostetter et al. (2011) provided evidence that,

> Among athletes, CA-MRSA may be spread from a) skin to skin contact with open abrasions or a contaminated person; b) surface to skin contact with contaminated treatment tables, sports equipment, synthetic turf, locker room, and restroom surfaces…; or c) sharing personal items, such as towels, razors, soap, and clothing (p. 18).

Since the modes of transmission are better known, it is important to educate athletic training members on what the prominent methods are and how to prevent the spread of infection.

Transmittal of Infection

The actual areas where CA-MRSA exist and can be transmitted are elaborated upon in additional studies. In the study by Montgomery, Ryan, Krause, Starkey (2010), "Open abrasions, therapeutic whirlpools, treatment tables, locker rooms, and athletic equipment are identified areas of transmission" (p. 8). The authors go on to further reveal, "Surfaces within the athletic training setting, when not properly disinfected, could possibly be reservoirs for CA-MRSA for the local community" (p. 8). In this same study while assessing samples collected from surfaces in school gyms, it was revealed that, "nine of the 10 (90%) schools that were sampled had at least two locations positive for MRSA" (p. 10). Six of the nine locker room sink handles tested positive and five of the nine samples collected from the locker room showers were positive. These conclusions suggest, "High traffic areas like locker rooms are potential areas for growth of

MRSA" (p. 10). Also, the findings indicate, "even casual users of high school locker rooms, such as physical education classes, are frequently exposed to MRSA" (p. 10).

In the study done by Montgomery et al. (2010), ten rural high school's athletic training rooms and locker rooms were tested for MRSA colonization. Ninety percent of schools sampled had at least two or more positive MRSA samples, thus indicating the need for proper hygiene education. The study did not assess cleanliness or hygiene of facilities, nor the cleaning products that were used. As a result they could not correlate the positive samples to a particular cleaning regiment. A similar study conducted by Stanforth et al. (2010) revealed that of the areas in the high school wrestling facilities that were sampled, five of the nine locker room sinks tested were positive, three of the nine lock room showers tested positive, eight of the nine locker room benches tested positive, and eight of the nine wrestling mats were positive for MRSA. These results support the need for a focus of education with BCPA staff, especially when dealing with prominent areas that could be infected with MRSA and which areas to focus on sanitizing.

Cleaning and Hygiene Practices

The next important thing to consider is hygiene practices. In a study done by Baldwin et al. (2011) there is knowledge that links disinfectant practices in the athletic training room and its affect on MRSA rates. Results of the study indicate, "Several groups, including the Centers for Disease Control and Prevention, have implicated improper cleaning and disinfection of the athletic training room as a contributing factor to MRSA infection" (p. 416). This emphasizes the importance of disinfection in athletic facilities, thus the need for thorough education on cleaning and hygiene practices. The researchers suggest, "in order to decrease the occurrence of MRSA, athletic trainers should have access to up-to-date information on MRSA prevention in the sports medicine facility" (p. 416).

Since the importance of disinfection is apparent, the next step is to look at the most effective types of disinfectants. In the study conducted by K. Hostetter et al. (2011), it was revealed that facilities that use bleach or bleach water solutions had more colonies than any other cleaning product. Also, the samples from the study provided evidence that disinfection is significant, when three of the seven athletic training rooms that had no intervention such as disinfection were positive for MRSA, where only two schools had positive cultures where intervention was present.

Some of the results from the study revealed that the product Whizzer that was used to clean equipment resulted in three positive MRSA samples out of the 48 collected. Also, in this study the use of the product Matt Kleen resulted in no MRSA positive cultures, which indicates from this research that it is effective in protecting against MRSA.

Lastly, timing of disinfections can be significant. When looking at the positive cultures during an imposed cleaning routine it was determined that one of twenty-four samples were positive when equipment was disinfected after each use, one of twenty-four samples were positive when cleaned hourly, and two of twenty-four samples were positive when equipment was cleaned daily.

Chapter 3: Research Methodology

Study Design

The study design was quasi-experimental pre and posttest design. The study was based using previous research to form a conclusion about what current problems exist. That conclusion was then used to create a testable interventional strategy. The interventional strategy was then carried out and helped provide information that can be used in future studies. Also, this study

revealed the need for future studies to further elaborate on its findings, which represents the cyclic nature of research itself.

Population, Sample, and Setting

The population used in this study consisted of BCPA staff that were over the age of eighteen. The participants were all current employees of the BCPA and all have direct contact with gym users. All of the staff that participated in this survey is also currently enrolled students at East Tennessee State University. The participants were chosen using a convenience sample and were selected during an employee monthly meeting. All persons present at the monthly meeting were given the opportunity to participate given that they met the requirements of being an employee of the BCPA and being at least eighteen years old. Using the advice given by the ETSU IRB it was determined that the conductors of the monthly meeting, which were the authoritative figures for the employees, were not to be present when the participants were allowed to give their consent to participate. This was done to prevent judgment of participation. The survey and education were given in the BCPA meeting room on the second floor. The participants were seated in chairs that were facing the projector screen, so everyone would be able to adequately hear and to see the presentation.

Instrumentation

The instrument used to collect data in this survey was created by Baldwin, Eberman, Gilmore, Kahanov, Roberts and Semerjian (2011) in their study, *Certified Athletic Trainers' Knowledge of Methicillin-Resistant Staphylococcus aureus and Common Disinfectants*. In that study the survey was validated and produced statistica lly significant results. Permission to use the survey was obtained by email on August 20th 2013. The survey tool (See Appendix C) was adapted and modified for this study, given that some questions on the original tool were not

relevant for this study purpose. The survey was used as the pre and post-test. The survey contained questions that ask how employees view MRSA and its significance in their workplace. The survey also asks questions to determine if the employees wash hands between meetings with clients and what products they believe are effective to clean equipment within the gym.

Data Collection

In this study, data was collected using a pre-existing survey. The survey tool was given to participants who were employees at the Basler Center for Physical Activity. An initial survey was completed by participants and a follow-up survey was collected after an MRSA educational session. The MRSA education was based on evidence based practice as determined by literature review or information received from the Centers for Disease Control website. A post education survey was done to see if knowledge changed and to predict if infection control practices would change in their work environment. The survey used for the pre and post-test in this study were the same.

Education and data was collected on October 9, 2013 during a regularly scheduled BCPA staff meeting. The purpose and intent of the study was explained to meeting attendees and participation was voluntary. After participants consented to be involved in the study, the pretest was administered. Participants were given 15 minutes to complete it. After the pretest was completed the MRSA education was conducted. The participants were then allowed to ask questions and then were asked to immediately begin the post test. All surveys were collected by the researcher.

Data Analysis

Data conducted during this study was imputed into the SPSS data analyzing program. It was then analyzed using a T-Test. The T-Test was used to compare the pre and post test data.

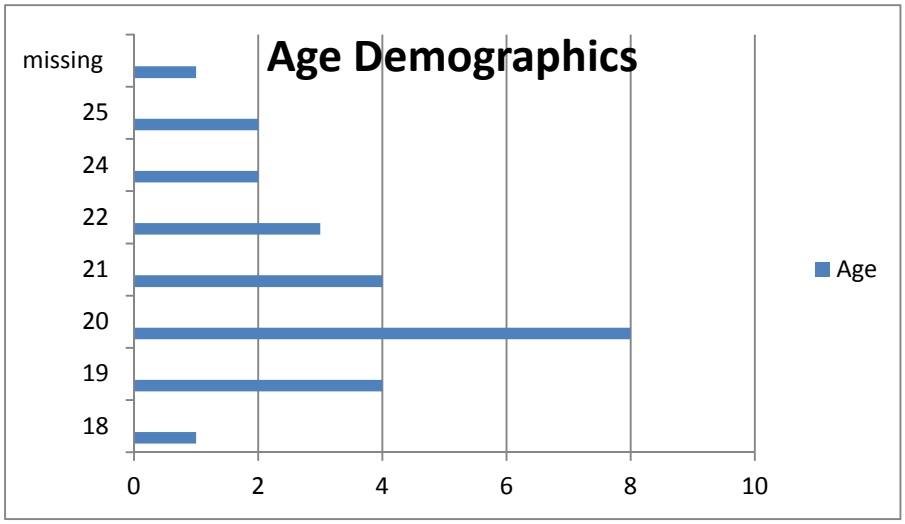
The T-Test scores were then analyzed to determine statistical significance of P values under 0.05. Results were illustrated using graphs and pie charts in order to visualize trends and results.

Chapter 4:Results

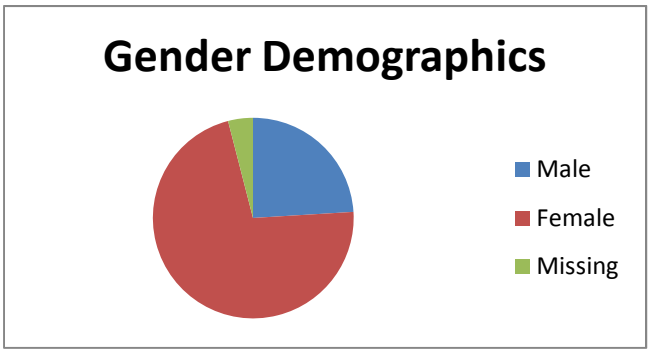
Results

The results for this study were processed in SPSS and organized into tables based on demographics and pre and post test results. The tables were set up by each individual question with frequency and percentages of each answer given in each table. The pre and post test results were then compared using a T-Test and statistical significance was then determined using P values. Using Microsoft word, bar graphs and pie charts were constructed to visually show the differences in demographics and pre and post test results.

The first thing analyzed in SPSS was the demographics in the study. It was determined that the ages ranged from eighteen to twenty-five with the majority of participants being twenty years old. Also, one participant in the study declined to answer.

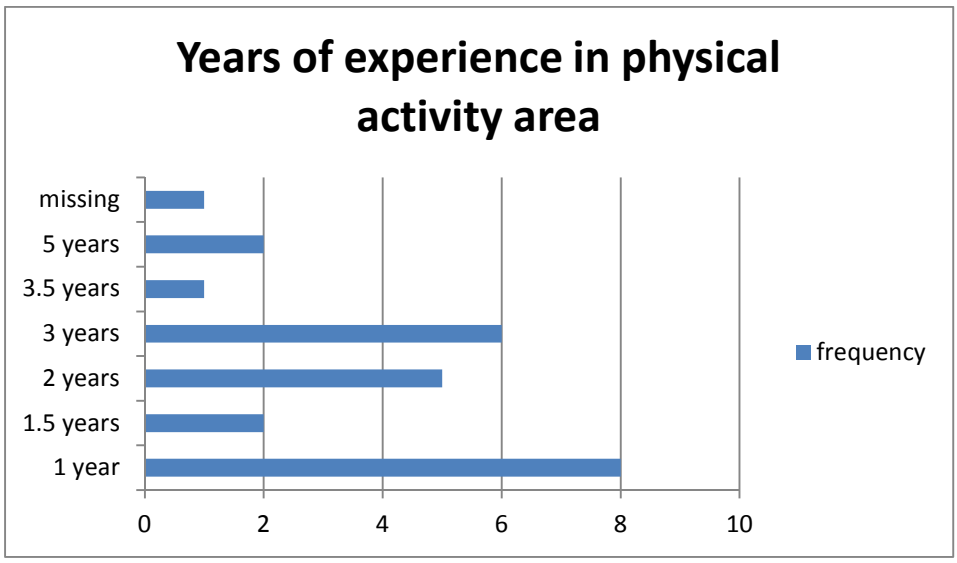


When assessing the percentage of male and females who participated in the study it was found that the majority of participants in the study were female. Eighteen participants were female (72%), six males participated (24%) and one participant in the study declined to answer.

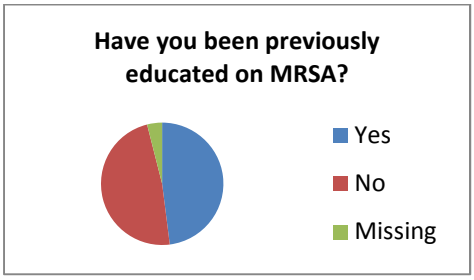


It was determined that the majority of the population had completed high school with 19 participants or 76% stating high school as their last educational level completed. It was also determined that 5 participants or 20% of the sample had completed a Bachelors degree. One participant declined to answer.

The forth thing analyzed in the demographics questions were the employees years of experience working in a physical activity area. The highest percentage was 32% or eight individuals who answered one year of experience. One participant declined to answer.

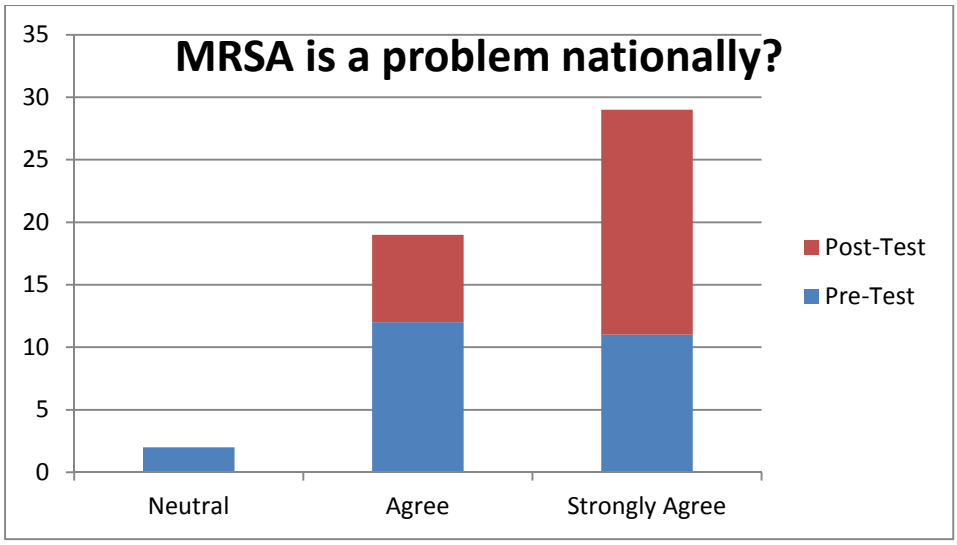


Twelve participants reported they had previously attended MRSA education sessions, 12 employees had not received previous education and one participant declined to answer.

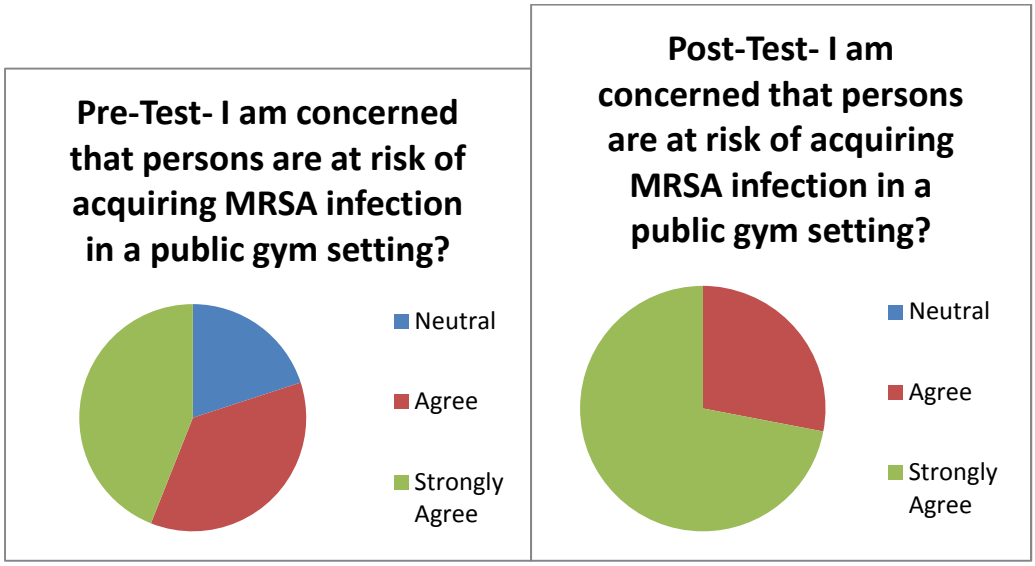


The last demographics question asked was if the participant had been educated before on MRSA and if so, how many times. A wide variety of answers were collected, with the majority consisting of eight people answering "once". Other responses included "five", "four", "many", and "plenty". Each of those answers was stated once; thirteen participants did not answer.

Once the demographics were addressed it was determined that the first survey item stating, “MRSA is a problem nationally," demonstrated a statistically significant P value of 0.004. In the pre-test the majority of participants, 12 or 48% answered agree. Also, 44% or 11 participants answered strongly agree and 2 or 8% answering neutral. In the post-test it was determined that 28% or 7 people answered agree, 18 or 72% answered strongly agree, and no one answered neutral.



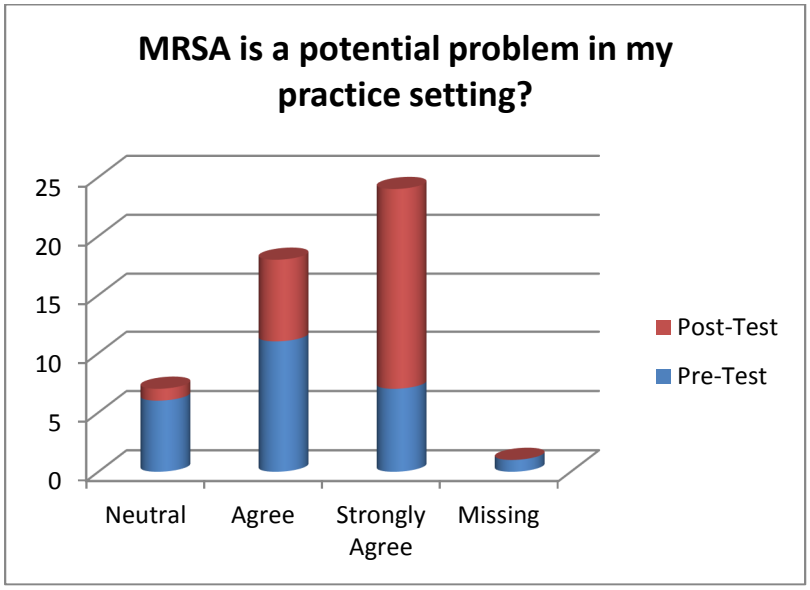
The second item in the survey, "I am concerned that persons are at risk of acquiring a MRSA infection in a public gym setting" also demonstrated a statistically significant P value of 0.001. The pre-test concluded that the majority of people, 11 or 44% answered strongly agree. Also, 9 or 36% answered agree and 5 or 20% answering neutral. On the post-test it was determined that 18 or 72% answered strongly agree and 7 or 28% answered agree. No one answered neutral of the post test.



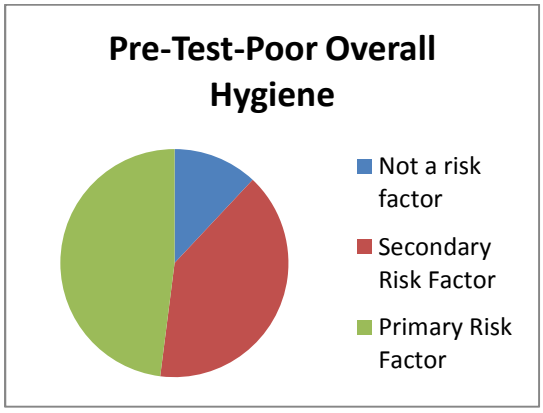
The third item on the survey, "Persons who visit public gym settings are aware of MRSA," had a P value of 0.135 which is not statistically significant. On the pre-test 10 or 40% answered disagree, 10 or 40% answered neutral, one answered strongly disagree, three agree, and one participant declined to answer. On the post-test the majority of participants 11 or 44% answered disagree. Also, one answered strongly disagree, four neutral, three agree, five strongly agree, and one participant declined to answer.

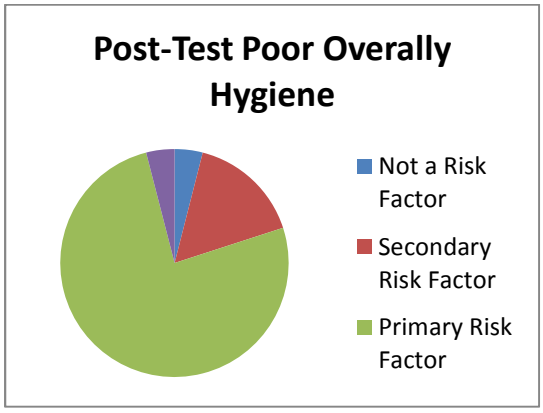
The fourth item on the survey, "MRSA is a potential problem in my practice setting," had a statistically significant P value of 0.000. The pre-test concluded that the majority of people 11 or 44% answered agree. Also, six answered neutral, seven strongly agree, and one declined to

answer. The post-test concluded that the majority of people 17 or 68% answered strongly agree. Also, seven answered agree and one answered neutral.



The fifth item in the survey, "Poor Overall Hygiene," showed a statistically significant P value of 0.005. The pre-test had a majority 12 or 48% answering primary risk factor. Also, ten answered secondary risk factor and three not a risk factor. The post-test revealed the majority 19 or 76% answering primary risk factor. Also, one answered not a risk factor, four answered secondary risk factor, and one declining to answer.



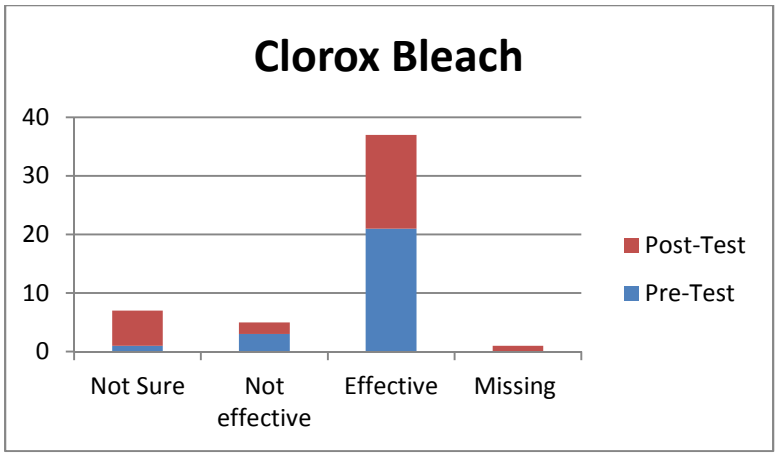


The sixth item in the survey, "Contaminated athletic equipment," was determined to have a P value of 0.575 which is not statistically significant. In the pre-test the majority of participants 21 or 84% answered primary risk factor. Also, three answered secondary risk factor and one not a risk factor. In the post-test the majority 19 or 76% also answered primary risk factor. Also, one answered not a risk factor and four as a secondary risk factor. One participant declined to answer.

The seventh item used in the survey, "Contaminated athletic training room," had a P value of 1.000, which is not statistically significant. The pre-test had a majority of participants 22 or 88% who answered primary risk factor. Also, one answered not a risk factor and two answered secondary risk factor. The post-test determined that the majority 20 or 80% answered primary risk factor. Also, four people answered secondary risk factor and one person declined to answer.

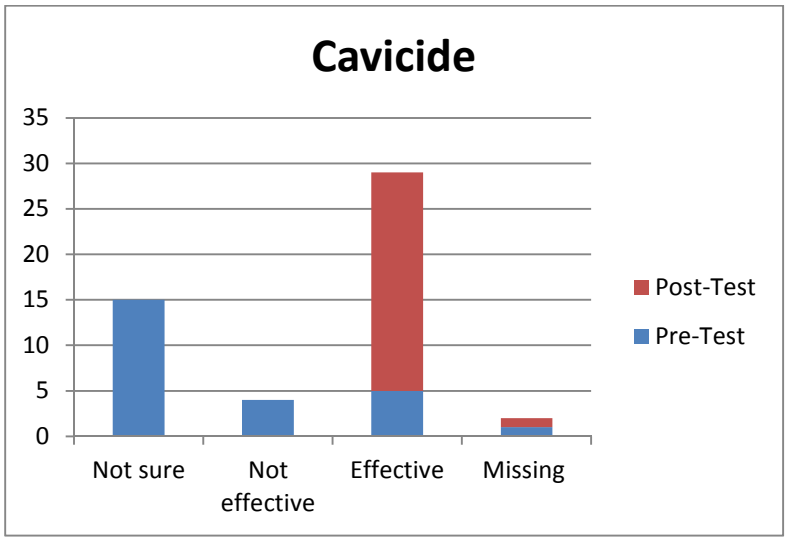
The eighth item, "Contaminated locker room equipment," had a P value of 0.327, which is not statistically significant. The majority of people of the pre-test 20 or 80% answered primary risk factor. Also, three people answered secondary risk factor and two answered not a risk factor. The majority of people on the post-test 20 or 80% answered primary risk factor. Also, five people answered secondary risk factor.

The ninth item, "Clorox bleach," had a P value of 0.026, which is statistically significant. The pre-test had a majority 21 or 84% of people who answered effective. Also, three answered not effective and one answered not sure. The post-test had a majority of people 16 or 64% who answered effective. Also, six who answered not sure, two not effective, and one person declined to answer.

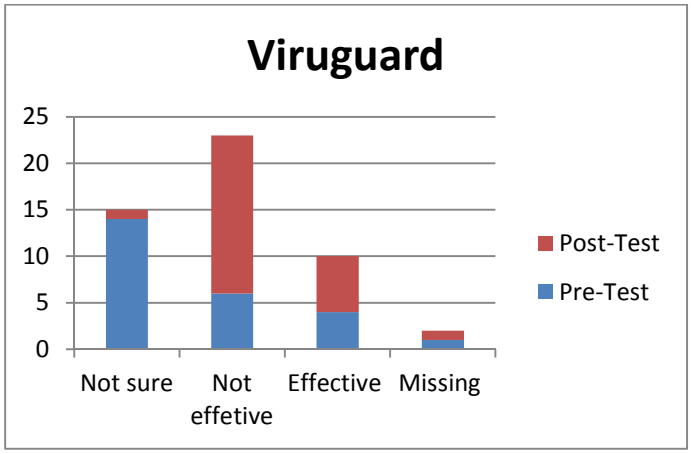


The tenth item, "Isopropyl alcohol," had a P value of 1.00, which is not statically significant. In the pre-test the majority 15 or 60% answered effective. Also, one answered not sure, five not effective, and one declined to answer. In the post-test the majority 13 or 52% answered effective. Also, eleven answered not effective and one answered not sure.

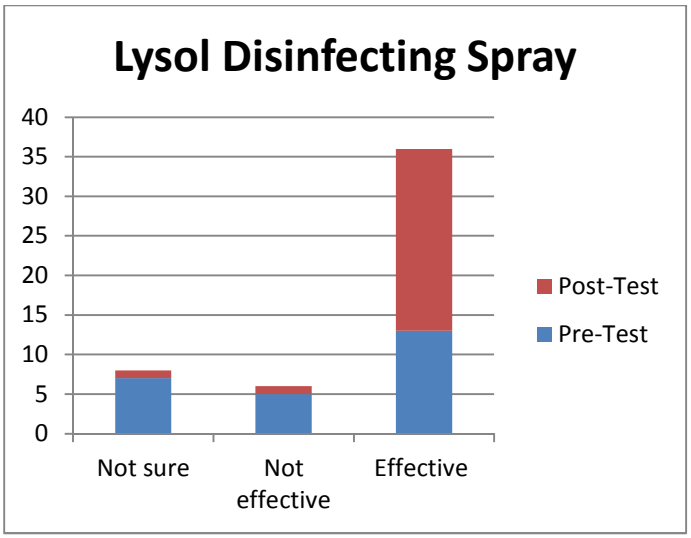
The eleventh item," Cavicide," had a P value of 0.000, which is statistically significant. The majority on the pre-test 15 or 60% answered not sure. Also, four answered not effective, five effective, and one person declined to answer. The majority on the post-test 24 or 96% answered effective. Also, one person declined to answer.



The twelfth item, "Viruguard," was found to differ signifigantly between pre and post test with a P value of 0.006. The pre-test had a majority 14 or 56% answered not sure. Also, six answered not effective, four effective, and one declined to answer. The post-test had a majority 17 or 68% who answered not effective. Also, one answered not sure, six effective, and one declined to answer.



The thirteenth item, "Lysol disinfecting spray," was statistically significant between pre and post test with a P value of 0.001. The pre-test revealed a majority 13 or 52% answered effective. Also, seven people answered not sure and five people answered not effective. The post-test had a majority 23 or 92% who answered effective. Also, one person answered not sure and not effective.



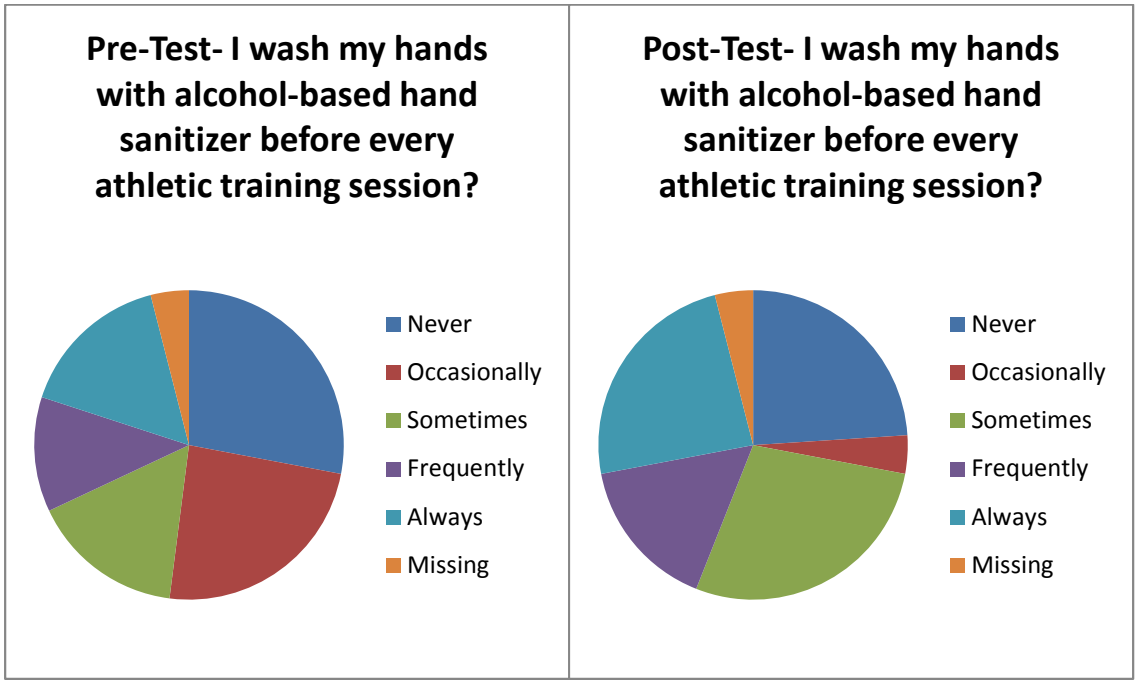
The fourteenth question, "What are important factors in using a disinfectant?" revealed a P value of 1.000, that was not statistically significant. The pre-test revealed the majority 10 or 40% answered frequency of use. Also, one person answered dilution, three people answered product of choice, and eleven answers could not be used because of multiple responses. The post-test revealed that two people answered soaking time, two people answered product of choice, and one person answered frequency of use. Also, due to multiple answers on a question that was not multiple choices; twenty of the responses could not be used.

The fifteenth item, "I wash my hands with soap and water before every athletic training session," revealed a P value that was not statistically significant of 0.328. The pre-test revealed the majority 7 or 28% answered frequently. Also, five people answered never, one person answered occasionally, five people answered sometimes, six people answered always, and one person declined to answer. The post-test revealed the majority 8 or 32% answered always. Also, four answered never, two answered occasionally, five answered sometimes, five answered frequently, and one person declined to answer.

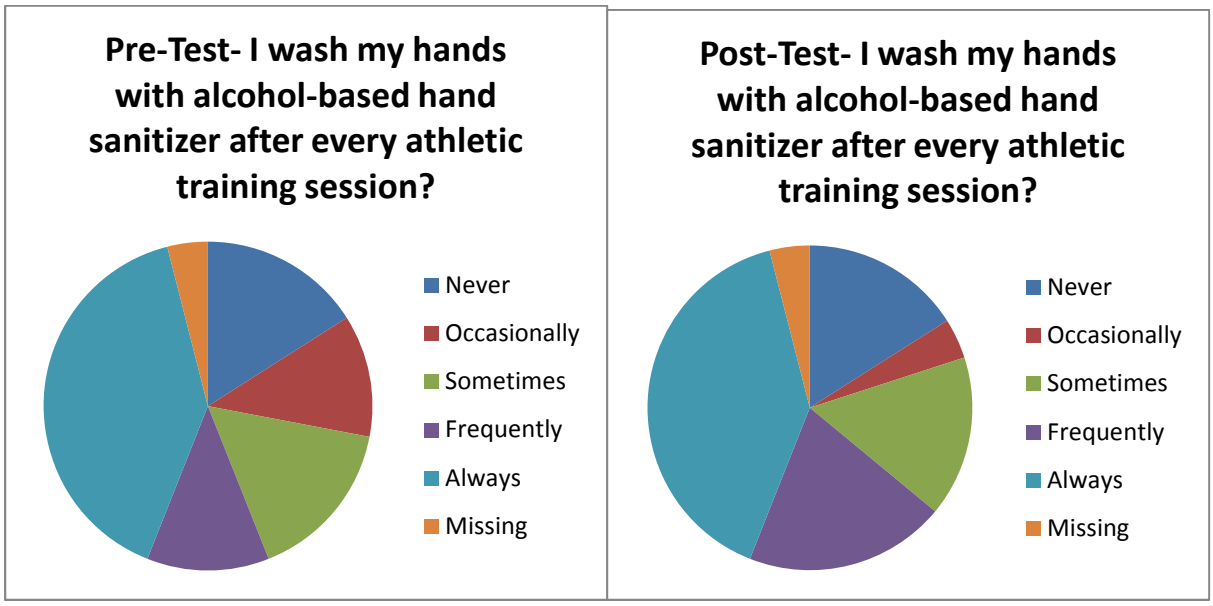
The sixteenth item, "I wash my hands with soap and water after every athletic training session," revealed a P value that was not statistically significant of 0.539. The pre-test revealed

the majority 11 or 44% answered always. Also, one person answered never, three people answered occasionally, three people answered sometimes, six people answered frequently, and one person declined to answer. The post-test revealed the majority 9 or 36% answered always. Also, one answered never, two answered occasionally, five answered sometimes, seven answered frequently, and one person declined to answer.

The seventeenth item, "I wash my hands with alcohol-based hand sanitizer before every athletic training session," showed a significant difference between pre and post test with a P value that was statistically significant of 0.007. The pre-test revealed the majority 7 or 28% answered never. Also, four people answered always, six people answered occasionally, four people answered sometimes, three people answered frequently, and one person declined to answer. The post-test revealed the majority 7 or 28% answered sometimes. Also, six people answered never, one person answered occasionally, six people answered always, four answered frequently, and one person declined to answer.



The last item, "I wash my hands with alcohol-based hand sanitizer after every athletic training session," revealed a P value that was not statistically significant of 0.295. The pre-test revealed the majority 10 or 40% answered always. Also, four people answered never, three people answered occasionally, four people answered sometimes, three people answered frequently, and one person declined to answer. The post-test revealed the majority 10 or 40% answered always. Also, four people answered never, one person answered occasionally, four people answered sometimes, five answered frequently, and one person declined to answer.



Chapter 5: Discussion

Discussion

When analyzing demographics in this study it was determined that the majority of participants were 20 years old. The reason for the majority being around 20 years old can be attributed to the fact that most participants are first degree baccalaureate students who work on ETSU campus. Also, the overwhelming majority 18 or 72% were female. The overwhelming

female sample was probably due to the lack of a random sample. The majority of participants 19 or 76% stated that their highest level of education completed was high school. The reason for this as mentioned above was that everyone who completed the survey is also a student at ETSU and most were 20 years old, which means most are still working on their first college degree. Also, the majority 8 or 32% stated they had one year of experience in a physical activity area. Lastly, the number of participants who had been educated about MRSA and the ones who had not were found to be even in this study. Of the participants who had been educated previously, the majority answered that they had been educated once before.

After analyzing the first question it was concluded that a strong shift occurred from the majority stating agree to the majority stating strongly agree. Also, on this question the post-test had fewer answers of agree and no one answered "neutral". It can be concluded that after receiving the education more study participants reported that MRSA is a problem nationally.

For question two, "persons are at risk of acquiring a MRSA infection in a public gym setting," there was a shift toward strongly agreeing between the pre and post test. Question three results indicated that the majority of participants disagreed that people who visit public gym settings are aware of MRSA. However, this relationship was not significant. In regard to question four, "MRSA is a potential problem in their practice setting," it was concluded that the majority opinion shifted from agree to strongly agree.

The significant difference between pre and post answers to question five lead the researcher to conclude that the majority of participants believed that poor overall hygiene is a primary risk factor for acquiring a MRSA infection in exercise facilities. Question six did not demonstrate statistical significant between the pre and post test. It is concluded that even though

fewer people answered "primary risk factor", there was a shift identifying more concern about contaminated athletic equipment being a risk factor for acquiring MRSA.

Question seven had responses that led to a conclusion that even though fewer people answered primary risk factor on the post test, there was still a shift of perceptions towards contaminated athletic training rooms being a risk factor for MRSA. For question eight it was determined that the majority answered primary risk factor and there was an overall shift towards belief that contaminated locker room equipment is a risk factor for acquiring MRSA. Question nine showed that there was a decrease in the answers about the effectiveness of Clorox Bleach and an increase in the number of "unsure" on the post test. This finding was not the desired result; it appears that education was not effective on this topic.

Question ten revealed that education was not beneficial for this question because in fact isopropyl alcohol is not effective in managing MRSA exposure. Even with that result the data did show a shift from five people to eleven people who answered not effective, which does indicate that several participants did change their answer to the correct one on the post-test. Question eleven results determined a shift in the data toward a majority answering the question with effective, which is consistent with the education that was provided that Cavicide was effective. In question twelve the difference moved towards the majority answering "not effective"; the education on this information was been beneficial.

Question thirteen showed several differences between the pre and post tests. From this data it can be determined that education was effective because more people reported that Lysol disinfectant spray was effective on the post-test than on the pre test. Question fourteen was confusing as nineteen of the post-tests contained multiple responses for a question that was not a multiple response question. Question fifteen overall revealed an extensive variety of answers that

made it impossible to determine if the education changed hand washing habits before every athletic training session.

In question sixteen the majority reported always washing hands before athletic session on the pre test so the education had little effect. Overall question seventeen showed a trend towards more use of hand sanitizer before every athletic training session after education was provided. Question eighteen concluded that the majority of respondents do use hand sanitizer after every athletic training session, but with such variation of results that the researcher is unsure if the education actually changed their habits.

Limitations

Limitation of this study is the small sample of employees at the BCPA; therefore, findings from this study may not be generalizable to other populations. Participants in this study were mostly females and may not represent the population of other physical activity center staff. Also, the sample of BCPA staff was a convenience sample and random selection was not performed. Another limitation of the study is that the specific roles of the BCPA staff were not assessed and education was not tailored to specific employment areas.

Conclusion

Results of this study indicate a shifting of perceptions and opinions on MRSA, primarily from pre to post education. Essentially, perceptions of the risk of acquiring MRSA in a public gym setting changed to strongly agree after education. The majority of participants disagreed that people who visit public gym settings are aware of MRSA. Additionally, there was a shift from agree to strongly agree on questions related to MRSA as a potential problem in their practice setting. Also, poor overall hygiene was considered by the employees after education as a primary risk factor for getting a MRSA infection.

When examining the results, there was a significant shift to more concern towards contaminated athletic training rooms being a risk factor for acquiring MRSA. Also, question seven had very similar results to question six and also had a shift toward contaminated athletic training rooms being an area with a risk factor of acquiring MRSA. Thirdly, the majority of participants viewed contaminated locker rooms as a primary risk factor for MRSA transmission. Fourthly, when looking at the change in responses to the effectiveness of Clorox bleach at killing MRSA there was a decrease in the number of people who perceived it to be effective in the post-test. Also, it was determined that more people were unsure of its effectiveness after education on the post-test, thus the goal of education on this question was not met.

When looking at the effectiveness of the education given about isopropyl alcohol it was determined that education was not completely beneficial since the majority chose that it was effective on the post-test. When assessing the effectiveness of the education on Cavicide it was determined that the education session was beneficial. The post-test revealed that the majority of participants choose that it was effective, which matched the information given during education. Lastly, when assessing the effectiveness of the education provided about Viruguard it was found that the education provided was beneficial. In the post-test the majority of people answered that Viruguard was not effective, which was the desired educational outcome.

In assessing the educational effectiveness of teaching on Lysol effectiveness it was found that the education was beneficial. The majority of participants chose that Lysol was effective, which was the desired outcome. When looking at the participants hand hygiene practices with soap and water before every training session it was determined that there were a wide array of answers between the pre and post test and thus it was hard to determine effectiveness. Some data that did stand out was that more people in the post-test answered always and less people

answered never when asked about their hand washing practices, so that was a positive thing to see that some people were doing better with hand hygiene.

Another hand hygiene measure that was assessed was if participants washed their hands with soap and water after every athletic training session. Data revealed that the majority answered always on the pre and post test, but once again as stated above there was a wide array of answers with this question as well. When looking at hand hygiene before every athletic training session using alcohol based hand sanitizer it was found that the majority did tend to state that they used hand sanitizer before every training session, but as mentioned above this question also had varying answers that all shifted towards the use. Lastly, the question of whether the participants used alcohol based hand sanitizers after every athletic training session revealed that the majority did appear to use it after every training session, but with varying frequencies. Overall, even though some questions did not yield results that indicated an increase in knowledge it does appear that the overall opinions and knowledge of the BCPA staff were increased from the educational tool that was used in this study.

When looking at the implications of this study it can be concluded that even though all aspects of the education were not proven effective, the education did increase the participant's knowledge of MRSA. The increased knowledge can be used in their practice setting. This knowledge can not only help them personally protect themselves against a MRSA infection, but can also prevent users of the BCPA from contracting an infection. The education used in this study can be used to help educate new employees at the BCPA and encourage them to have a good work practice. Also, hopefully this study will encourage the participants to change their practice and how they clean equipment. When applying this study to nursing, it is important that nurses understand how to effectively educate members of the community about Community

associated MRSA, including its prevalence in community physical activity centers. Also, this study should encourage nurses to focus on setting beyond the hospital setting when conducting research.

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Appendix A: BCPA letter of support

To Whom it May Concern:

Afton Cope has the permission of Campus Recreation to work with us on surveying, interacting with and instructing the staff on MRSA.

Please let me know if you have any questions.

Nani Wilemon
Fitness Coordinator
Basler Center for Physical Activity
Wellness Committee Chair
East Tennessee State University
Office 423-439-7983
Fax 423-439-7970
wilemon@etsu.edu

Appendix B: IRB Approval Letter

East Tennessee State University Office for the Protection of Human Research Subjects Box 70565 Johnson City, Tennessee 37614-1707 Phone: (423) 439-6053 Fax: (423) 439-6060

Accredited Since December 2005

IRB APPROVAL – Initial Expedited Review
September 25, 2013
Afton Cope
Re: Methicillin-resistant Staphylococcus aureus Education Effectiveness for athletic trainers at a University community physical activity center
IRB#: c0913.4s
ORSPA #: n/a

The following items were reviewed and approved by an expedited process:

· xform New Protocol Submission; Informed Consent Document (no version date, stamped approved 9/24/2013); Survey; Demographics Questionnaire; Educational PowerPoint Presentation & Handout; Permission; COI forms; References; Resume

On **September 24, 2013**, a final approval was granted for a period not to exceed 12 months and will expire on **September 23, 2014**. The expedited approval of the study will be reported to the convened board on the next agenda.
The following **enclosed stamped, approved Informed Consent Documents** have been stamped with the approval and expiration date and these documents must be copied and provided to each participant prior to participant enrollment:
· Informed Consent Document (no version date, stamped approved 9/24/2013)

Federal regulations require that the original copy of the participant's consent be maintained in the principal investigator's files and that a copy is given to the subject at the time of consent.

Projects involving Mountain States Health Alliance must also be approved by MSHA following IRB approval prior to initiating the study.
Unanticipated Problems Involving Risks to Subjects or Others must be reported to the IRB

(and VA R&D if applicable) within 10 working days.

Proposed changes in approved research cannot be initiated without IRB review and approval. The only exception to this rule is that a change can be made prior to IRB approval when necessary to eliminate apparent immediate hazards to the research subjects [21 CFR 56.108 (a)(4)]. In such a case, the IRB must be promptly informed of the change following its implementation (within 10 working days) on Form 109 (www.etsu.edu/irb). The IRB will review the change to determine that it is consistent with ensuring the subject's continued welfare.
Sincerely,
Chris Ayres, Chair
ETSU Campus IRB

Appendix C: Survey Instrument

Methicillin-resistant Staphylococcus aureus Education Effectiveness for athletic trainers at a University community physical activity center

1. *Check the box that best represents your answer.*

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
MRSA is a problem nationally?					
I am concerned that persons are at risk of acquiring a MRSA infection in a public gym setting					
Person who visit public gym settings are aware of MRSA?					
MRSA is a potential problem in my practice setting?					

2. What do you believe are risk factors for a MRSA infection? *Check the box that best represents your answer.*

	Primary Risk Factor	Secondary Risk Factor	Not a Risk factor
Poor Overall Hygiene			
Contaminated Athletic Equipment			
Contaminated Athletic Training Room			
Contaminated Locker Room equipment			

3. Which of the following products are effective against MRSA? *Check the box that best represents your answer.*

	Effective	Not Effective	Not Sure
Clorox Bleach			
Isopropyl Alcohol			
Cavicide			
Viruguard			
Lysol Disinfectant Spray			

4. What are important factors in using a disinfectant?
   (a) frequency of use
   (b) soaking time
   (c) dilution
   (d) product of choice
   (e)intensity of scrubbing/mopping

5. *Check the box that best represents your answer.*

Question	**Always**	**Frequently**	**Sometimes**	**Occasionally**	**Never**
I wash my hands with soap and water before every athletic training session?					
I wash my hands with soap and water after every athletic training session?					
I wash my hands with alcohol-based hand sanitizer before every athletic training session?					
I wash my hands with alcohol-based hand sanitizer after every athletic training session?					