

Running head: MRSA on Wrestlers

Methicillin Resistant *Staphylococcus aureus* among Wrestlers at a private University in the
Southern United States

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Abstract

Methicillin Resistant *Staphylococcus aureus* (MRSA) is a growing threat among athletes. With the discovery of antibiotics, many people believed the problems associated with infectious diseases ended, but a new problem of antibiotic resistance has emerged. Mutated forms of bacteria soon developed resistance to antibiotics. A methicillin resistant strain of *Staphylococcus aureus* referred to as MRSA was first seen in hospitals and is now considered a major source of nosocomial infection. For a number of years non-hospital associated or Community Associated MRSA (CA-MRSA) has been seen among individuals living in crowded settings. Athletes, including wrestlers, have been particularly prone to these infections because of frequent close contact. Researchers presumed that wrestlers' behavior is responsible for most transmission and spread of MRSA. The relationship between wrestlers' lifestyle and transmission of MRSA infection was studied at a private Christian University in the Southeastern United States. Twenty-eight wrestlers were given a brief researcher-developed descriptive survey including demographic, quantitative, and open-ended qualitative questions. The resulting data were analyzed using descriptive statistics. The results of this study showed that the majority of wrestlers lack the basic knowledge on personal hygiene and ways to protect themselves from MRSA.

MRSA

Definition

With the discovery of antibiotics, many people assumed the problems associated with infectious diseases were ended, but a new problem of antibiotic resistance emerged. Mutated forms of bacteria develop resistance to antibiotics and give rise to newer strains of infections. Several theories have been proposed to explain the development of antibiotic resistance. One popular theory of antibiotic resistance is natural selection. According to this theory, after the use of antibiotics, not all pathogens die. Instead, the most vulnerable and sensitive bacteria get destroyed while the stronger organisms survive and pass their resistance to daughter cells during replication, or to other bacteria through conjugation (Weber, 2006). Since the 1970s scientists have discovered a self-protection pattern in bacteria. In this process, called SOS response, bacteria use mutation for their benefit using it as a form of self-defense. Even though mutations are usually harmful, bacteria in fact use mutation for their benefit. Under extreme environmental stress, bacteria utilize various mechanisms to fix the cellular damage. When other mechanisms fail, genes coded for protein products to precipitate, rapid mutations are activated. Mutations may occur 10,000 times faster than normal cell replication (Stix, 2006). The previously manufactured antibiotics currently being used thus do not act destroy this mutated strain of bacteria (Stix, 2006).

MRSA been reported as the most common cause of hospital-acquired infection for a number of years. Methicillin-resistant *Staphylococcus aureus* (MRSA) is a mutated form of bacteria resistant to antibiotics, known as beta-lactams, such as methicillin, oxacillin, penicillin, and amoxicillin, and the cephalosporins, such as cephalexin, and cefactor (Tortora, Funke, & Case, 2003). It was first discovered in 1961 in the United Kingdom

(Schneider-Lindner, Delaney, Dial, Dascal, & Suissa, 2007) and the first reported case of MRSA was in 1968 in the United States. For all MRSA infections, the annual incidence ranged between 18 and 25.7 cases per 100,000 population. The majority of these, approximately 75%, were skin and soft tissue infections. There is only limited information on morbidity and mortality of CA-MRSA (Hill, 2006).

Staphylococcus aureus is normally found on the skin or in the nose of 20-30% of healthy individuals. *S. aureus* most commonly colonizes in the nostrils. Colonization is the state of *S. aureus* being present without causing any symptoms. When symptoms are present, it is called an infection (New York Department of Health, 2006).

The primary symptom of staphylococcal infections, including MRSA, is a red area with a dimple appearance on the skin, which later develops into an abscess. Other symptoms of MRSA include drainage of pus or other fluids from the site, warmth around the infected area, and fever. The more serious systemic MRSA symptoms include chills, rash, shortness of breath, chest pain and muscle ache. Patients should seek medical attention as soon as the systemic symptoms appear or if the wounds do not heal. A culture from the infected site is taken to confirm MRSA infection (Medline Plus, 2005).

Types of MRSA

Two types of MRSA have been identified based on their epidemiology and the characteristics of the causative MRSA strains (Schneider-Lindner et al., 2007), namely Hospital Associated MRSA (HA-MRSA) and Community Associated MRSA (CA-MRSA). The antimicrobial and molecular resistance profiles of CA-MRSA strains are different from HA-MRSA strains (Nicolle, 2006). HA-MRSA occurs among persons in hospitals and health facilities who have weakened immune systems. Failure to follow proper sanitary

procedures by medical staff may transfer bacteria colonies from patient to patient. In HA-MRSA, patients have

- (1) a MRSA infection identified after 48 hours of admission to a hospital;
- (2) a history of hospitalization, surgery, dialysis, or residence in a long-term care facility within 1 year of the MRSA culture date;
- (3) a permanent indwelling catheter or percutaneous medical device (eg., tracheostomy tube, gastrostomy tube, or Foley catheter) present at the time of culture; or
- (4) a known positive culture for MRSA prior to the study period (Naimi et al., 2003, p.2977).

CA-MRSA is a relatively new form of infection, acquired by people who have neither been hospitalized nor had a medical procedure within the past year (Centers for Disease Control and Prevention, 2007). CA-MRSA is common among groups of people who share contaminated items on a regular basis, or live in crowded settings, e.g. inmates and athletes. The commentary published in the Canadian Medical Association Journal reports the 5 Cs implicated in transmission of CA-MRSA namely; Crowding, frequent skin Contact, Compromised skin, sharing Contaminated personal care items, and lack of Cleanliness (Hawkes, Barton, Conly, Nicolle, Barry, & Ford-Jones, 2007). The five transmission factors that have been associated with CA-MRSA can be explained as

- (1) Crowding-- Outbreaks occurring in places where people are in close proximity
- (2) Frequent contact-- Football linemen often have skin infections in sites where they have skin abrasions
- (3) Compromised skin-- Broken skin is more likely to be an infection site than intact skin
- (4) Contaminated surfaces and shared items-- All items that may be shared, including towels, razors, and toothbrushes
- (5) Lack of cleanliness-- Transmission is likely in the places where people cannot achieve appropriate hand and body hygiene (Stephenson, 2004).

The populations at increased risk of CA-MRSA are children less than two years old, athletes (mainly contact-sport participants), inmates of correctional facilities, injectable drug users, minority populations (native or aboriginal, African-American), homosexual men, military personnel, veterinarians, pet owners, and pig farmers. CA-MRSA can easily spread through skin-to-skin contact in following circumstances:

- (1) shaking hands or direct contact with the skin of another person while playing
- (2) sharing personal items like towels or athletic equipment in the gym or on the field
- (3) openings in the skin such as cuts or abrasions that are not protected by a dressing or other bandage (Hawkes et al., 2007).

Researchers at the University of Southern California documented that highly virulent strains of *Staphylococcus aureus* caused outbreaks of serious CA-MRSA infections among athletes, including football and baseball teams at the professional college and high school levels. The most common sources of CA-MRSA among athletic activities involving physical touch were person-to-person contact during practice or competitive play, and sharing items (New York Department of Health, 2006).

Treatment

MRSA can be treated by proper wound and skin care if it is detected in its early stage. If the infection has reached its later stage, however, it may lead to complications and may require antibiotics for proper treatment. Untreated MRSA can lead to complications including cellulitis, blood poisoning, toxic shock syndrome, endocarditis, pneumonia, and even death. Antibiotics like vancomycin, trimethoprim-sulfamethoxazole, and linezolid can be used. Supplemental oxygen and intravenous medication may be required to treat severe infections. It is important to finish all doses of antibiotics. Further drug resistance can be developed in the bacteria because of unfinished doses of antibiotics (Centers for Disease Control and Prevention, 2007).

Prevention

Maintaining personal hygiene and washing hands are the key issues in public health that help to curb the incidence of several diseases. Covering all wounds with a clean bandage and cleaning sporting equipment before using are also preventive measures. Practicing proper sanitary habits in hospitals prevents transferring bacteria colonies from one patient to another (Medline Plus, 2005). The early measures that can possibly prevent the spread of cutaneous MRSA infection, especially among athletes are early detection, avoidance of contact with others, and topical treatment of the skin wounds (Cohen, 2005).

Both the CDC and the National Collegiate Athletic Association (NCAA) have issued recommendations to reduce spreading MRSA infections among athletes. Their recommendations include encouraging athletes to practice good personal hygiene while discouraging them from sharing personal items. Athletes are encouraged to maintain good general hygiene with regular bathing and hand-washing. They should also take proper care

of their wounds and cuts to prevent infection. Athletes should refrain from sharing personal items, play equipment, and other physical items like towels or pads that might have come in contact with patients with CA-MRSA infection (Duke Infection Control Outreach Network, 2007).

Intervention

MRSA in the News

The news has recently reported an increasing prevalence of the disease in school settings and athletic centers. In some parts of the United States, CA-MRSA is nearing epidemic levels. Reports show that MRSA has infected students in school districts in at least six states, and at least three children have died. A high school student, Ashton Bonds, 17, from Bedford, Virginia lost his life to MRSA infection in October (Medline Plus, 2007). Other deaths and several cases of MRSA infection have occurred throughout the United States. Several schools and universities throughout the United States have been shut down to clean and disinfect their premises to prevent MRSA infection (Medline Plus, 2005).

MRSA poses a considerable burden in terms of mortality, morbidity, and healthcare costs. The emergence of antibiotic resistance poses public health threat as new strains of MRSA are resistant to increasing numbers of antibiotics. Furthermore, this resistance is moving from the hospital to the community, thus posing an even greater threat than before. The major concern antibiotic resistance raises is that the current first-line treatment for MRSA infection may become ineffective in the near future in an increasing number of cases (Schito, 2006).

Centers for Disease Control and Prevention

The Centers for Disease Control and Prevention is implementing a range of measures to prevent the spread of MRSA. They are as follows:

- (1) CDC is collaborating with state health departments and academic medical centers to identify and promote effective strategies to reduce MRSA transmission in community and healthcare settings;
- (2) CDC has launched a national evidence-based educational campaign to prevent antimicrobial resistance in healthcare settings;
- (3) CDC is conducting proficiency testing to assist public health laboratories in determining the antibiotic susceptibility of staphylococcal bacteria;
- (4) CDC is building national resource library of MRSA to identify genetic patterns or relationships among different types of MRSA that could be used to take public health action;
- (5) CDC is researching the role of staphylococcal toxins that may provide answers to questions about why some MRSA infections are more invasive, or lead to rapid death (MRSA infection org, 2005, ¶ 6).

An experts' meeting convened in July 2004 by the Centers for Disease Control and Prevention devised strategies for clinical and public health management of MRSA in the

community. A report was published in March 2006 summarizing the strategies based on the information available from the convention and additional data available as of January 2006. The epidemiology, microbiology, and pathophysiology of CA-MRSA infections can be understood completely and optimal prevention and treatment strategies can be identified only after thorough research and availability of more data. The intervention strategies include four components, namely, prevent infection, diagnose and treat infection effectively, use antimicrobials wisely, and prevent transmission. Based on the current information available, participants in the CDC-convened experts' meeting identified the following strategies as reasonable, with a focus on skin and soft tissue infections (SSTI).

- (1) MRSA should be considered whenever symptoms of a possible *S. aureus* infection are present.
- (2) When possible, abscesses and purulent lesions should be cultured for antibiotic sensitivity.
- (3) The first line of treatment for furuncles, abscesses, and septic joints is incision and drainage.
- (4) In addition to drainage, empiric treatment with an antibiotic may be appropriate for some patients with purulent skin lesions.
- (5) Local susceptibility data should guide the choice of antibiotics for skin infections. For mild to moderate illness without a significant co-morbidity, a beta-lactam drug remains a good first-line antibiotic choice.
- (6) When an oral course of therapy against MRSA is preferred for outpatient treatment of skin and soft tissue infections, several antimicrobial agents can substitute beta-lactam drugs.

- (7) Depending on geographic area and passage of time, incidence rate of non-beta-lactam resistance varies. Constant monitoring of local sensitivity pattern of community *S. aureus* should be performed to direct decision-making procedure pertaining to the practical management of the disease.
- (8) Patients with severe staphylococcal infections, especially those requiring hospitalization, may be administered intravenous antimicrobial agents. The first-line of treatment for severe infections probably caused by MRSA is vancomycin. The results of cultures and antimicrobial sensitivity determine the final treatment decisions.
- (9) The vital element of skin and soft tissue case management is patient education. Information about hygiene and modes of transmission should be administered.
- (10) Once a skin and soft tissue infection is identified in a patient, clinicians should constantly inquire about similar cases in close contacts or household members. In case of a potential outbreak of cases is recognized outside of a single household, for example, in an athletic team, or school, notification has to be sent to the local public health department.
- (11) If there is an ongoing MRSA transmission in a closely-associated, well-defined group, or if a particular patient has several documented reappearance of MRSA infection.
- (12) All patients in outpatient and inpatient healthcare settings should be administered standard infection control precautions.
- (13) Clear instructions have to be given to patients with skin and soft tissue infections to return to healthcare settings as soon as possible if the symptoms worsen or do not

improve within 48 hours, or if they develop systemic symptoms (Gorwitz et al., 2006).

National Collegiate Athletic Association

The National Collegiate Athletic Association (NCAA) necessitates an examination of all wrestlers for any sign of skin infection before any participation. The wrestles should provide a letter from the team physician “documenting clinical diagnosis, and/or culture results, if relevant, and an outline of treatment to date” (Skin Infections, 2007, WA-15).

A wrestler can be medically disqualified from participation in a practice or competition for any skin conditions, including open wounds that cannot be protected. Knowledgeable physicians and/or certified athletic trainers are to conduct the medical examinations suggestively in the presence of an experienced dermatologist. Wrestlers should provide a written documentation from a physician if they are undergoing treatment for a communicable skin disease at the time of practice or competition (Skin Infections, 2007). In a report published in July 1981 and revised in June 2007, the NCAA recommended guidelines for disposition of skin infections are as follows:

- (1) Wrestler must have been without any new skin lesion for 48 hours before the meet or tournament.
- (2) Wrestler must have completed 72 hours of antibiotic therapy and have no moist, exudative, or draining lesions at the time of practice/competition.
- (3) Gram stain of exudate from questionable lesions (if available).
- (4) Active bacterial infections shall not be covered to allow participation (Skin Infections, 2007, WA-15).

History of MRSA at a private University
in the Southern United States

Director of Athletic Training (C. Casola, personal communication, March 27, 2008) reported that in the Fall of 2004, approximately 30% of the football team contracted staphylococcal infection, which drew authorities' attention. All the cases were treated as MRSA and further interventions were carried out to curb the incidence rate. By 2005, the incidence rate dramatically decreased to only 15% of infected football players. The rate was decreased by 80% in 2006 and almost by 90% in 2007. The University football team enacted intervention programs including implementing stricter rules on cleanliness of lockers and training rooms, replacing turf on the football field, updating protocols regarding the use of training facilities, modifying the use and handling of personal items, and emphasizing MRSA prevention strategies. The coaches and concerned authorities mandated players to take shower before leaving the football facilities. Typical hand-washing signs produced by Occupational Safety and Health Administration (OSHA) signs were used in the bathrooms, commercial cleaning detergent was used for washing clothes, and football players were made proactive about taking care of abrasions. An orientation that included information about MRSA and prevention strategies were given to football players at the beginning of each semester. In addition, in the Fall of 2006, the football team moved to newly built facilities with better equipment and personal lockers and benches. In an effort to combat MRSA, the University football team organized their system, educated their players, and restructured their sport. The significant changes dramatically dropped the staphylococcal infection cases among football players, resulting in zero staphylococcal cases among about 100 football team in the Fall 2007.

Wrestling was added as the 18th NCAA Division I sport at the University in February 2005, with competition beginning in the academic year 2006-2007. In June 1994, the University had dropped wrestling after successful 20 years due to Title IX and a move to The Big South, a new Conference, which did not sponsor wrestling. In the first year after a 12-year pause, the reintroduced wrestling team won the NCAA East Regional Qualifier, sending four competitors on to the national championship. For the first time in school history, the wrestling team hosted the qualifier in the second year of being reestablished at the University (Brown, 2008).

In January 2007, the wrestling team relocated to the facilities that were previously used by the football team. It was an effort to upgrade the facilities to help protect players from MRSA infection, since the wrestling team that started out in another location saw a number of MRSA cases in the old facilities. The facilities previously used by football players were renovated, old mats were replaced, table tops were redone, and hand sanitizers were installed at accessible locations. The number of staphylococcal cases, however, soared.

Along with the success and honor, the wrestling team has challenges to overcome. One of the challenges is to keep the players healthy by minimizing risky behaviors. Since, wrestlers are at higher risk of MRSA because of frequent close contact and the nature of game, concerned authority at the University are focusing on improving the facilities and educating wrestlers.

Method

Participants

Twenty-nine of the 30 surveys given to the Athletic Director were returned to the researcher. One incomplete survey was discarded because the majority of the questions were

unanswered. Therefore, this study is based on a total sample of 28 wrestlers and coaches.

The participants consisted of nine freshmen, nine sophomores, six juniors, three seniors, and two coaches. Among the participants, 16 lived on campus and 8 were off-campus residents, while the residency status of four participants was not reported.

Instruments

A researcher-developed descriptive survey with demographic, quantitative, and open-ended qualitative questions was used to collect data and information from participants (see Appendix). The researcher used an Excel program to perform descriptive statistical procedures to analyze the data collected.

Procedures

First phase. The incidence data of staphylococcal infection among wrestlers in three consecutive semesters was obtained from the Athletic Department at a liberal arts Christian University located in the Southeastern United States. The available data were used to compare the number of cases in succeeding semesters.

Second Phase. A paper-and-pencil retrospective survey was conducted in the beginning of the Spring 2008 semester in the male wrestling team at the University. Approval to conduct a survey among wrestlers was granted by the University's Institutional Review Board. The director of the Athletic Department distributed the surveys to the participants. The surveys were given to the wrestlers whether or not they reported MRSA in the previous semester. The participants completed the survey pertaining to the wrestlers' basic hygiene practices and their awareness of MRSA. The results of the survey were used to derive conclusions about the incidence and effects of MRSA on wrestlers.

Results

The obtained data were tallied and charted using Excel. Data analysis identified two main themes relating to wrestlers' susceptibility to MRSA, namely:

- (1) personal hygiene (hand-washing, sharing items) and cleanliness (room, facilities), and
- (2) knowledge about MRSA (protection, treatment)

The report provided by the Athletic Department shows that there were two Staphylococcal cases among wrestlers in 2006-2007 season, and nine in 2007-2008 season. Table 1 gives detailed information for each season. There is a subsequent rise in the number of Staphylococcal cases in the second season, 2007-2008. The breakdown of staphylococcal cases for each semester is shown in Figure 1.

Table 1

Comparison of Staphylococcal cases in two consecutive seasons

Season	No. of staphylococcal cases	Total no. of wrestlers	Percentage
2006-2007	2	33	6%
2007-2008	9	44	20%

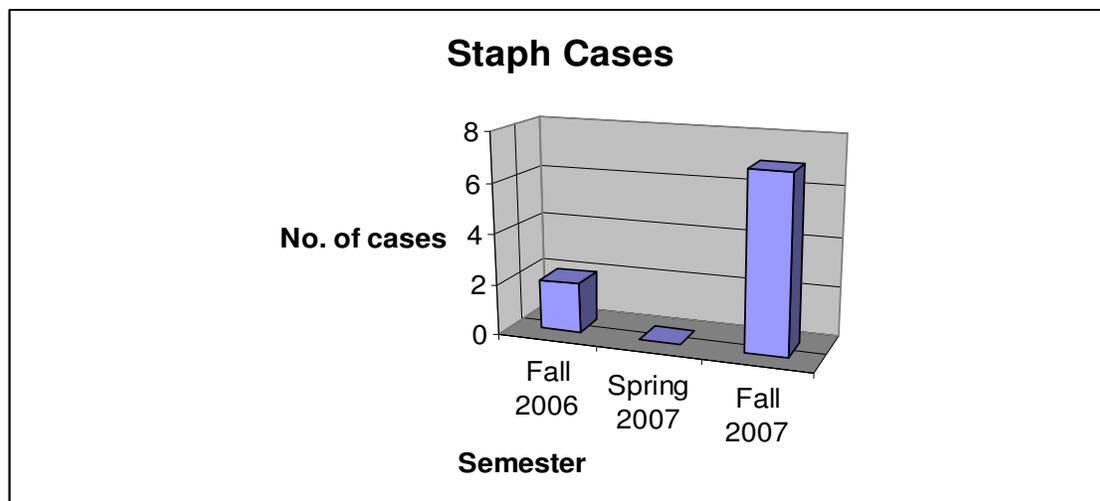


Figure 1. A comparison of staphylococcal cases in three consecutive semesters

The mean age of participants was 21.2 years, with the age ranging from 18 to 48 years. The median age was 20 years and the modal age was 19 years. The detailed demographics of participants are shown in Table 2, Table 3, and Table 4.

Table 2

Classification of wrestlers

Classification	Frequency
Freshman	9
Sophomore	9
Junior	5
Senior	3
Coach	2

Table 3

Housing of wrestlers

Housing	Frequency
On campus	16
Off campus	8
Not reported	4

Table 4

Age of wrestlers

Age	Frequency
18	4
19	9
20	6
21	2
22	2
23	2
24	1
26	1
48	1
Total	28
Mean	21.2
Median	20
Mode	19

Personal hygiene of wrestlers was measured by their response to various survey questions pertaining to their health and hygiene. They were asked questions related to their habit of sharing personal items, hand-washing, room cleanliness, and perception of cleanliness of the wrestling facilities.

The survey showed that a sizable number of wrestlers share personal items. Nearly 40% of all wrestlers shared their uniforms, towels, and clippers. Nearly a third shared clothing and 14.3% shared deodorants. Almost all wrestlers refrained from sharing razors, and 89.3% did not share pads. Wrestlers also answered that they share headgear, wrestling shoes, mat, and shower. Other items that were shared are listed in Table 5.

Table 5

Sharing of items

Items	Yes	No	Total	Yes (%)	No (%)
Uniforms	11	17	28	39.3	60.7
Clothing	9	19	28	32.1	67.9
Towels	11	17	28	39.3	60.7
Razors	1	27	28	3.6	96.4
Deodorants	4	24	28	14.3	85.7
Clippers	11	17	28	39.3	60.7
Pads	3	25	28	10.7	89.3

The survey showed that 27% of the wrestlers wash their hands often, while 43% wash their hands whenever necessary. 'Whenever necessary' was not defined in the survey. A

majority of wrestlers (79%) said that they wash their hands for 10 seconds, and only one wrestler washed for 20 seconds. Eighteen percent washed their hands for only for five seconds. Of all who wash their hands often, 25% wash only for five seconds. Seventy-five percent of wrestlers washed their hands for 10 seconds and responded that they do it often. One wrestler's response was to wash his hands whenever necessary for 5 seconds. Eighty-two percent of wrestlers used hot water to wash their hands, while 18% washed with cold water. Table 6 shows the breakdown of wrestlers' hand-washing habit. All wrestlers surveyed answered that they use soap while washing their hands.

Table 6

Comparison of time and frequency of washing hands

Seconds	Often	When necessary	Often (%)	When necessary (%)
5	4	1	25	8.3
10	12	10	75	83.3
20	0	1	0	8.3
Total	16	12	100	100

The survey illustrated that 71% of wrestlers own a personal vacuum cleaner while 43% own a personal washer/dryer. Personal cleanliness was not apparent among wrestlers, however, with only 25% respondents washing the bed-sheets often and 7% vacuuming their room often. Half the respondents said that they hardly ever vacuum their room, while 18% said they hardly ever wash their bed-sheets. Table 7 shows wrestlers' trend of washing clothes, bed-sheets, and vacuuming their rooms.

Table 7

Cleanliness of the room

Item	Often	Hardly Ever	Whenever necessary	Often (%)	HE (%)
Clothes	17	1	10	61	4
Bed-sheets	7	5	16	25	18
Vacuum room	2	14	12	7	50

The respondents varied in their perception of cleanliness of training facilities. The wrestlers were asked to rate their perception of cleanliness of training room, locker, weight room, and wrestling room.

According to the survey, 89%, 61%, 54%, and 29% respondents respectively rated training room, wrestling room, weight room, and locker to be clean. A majority of 68% of respondents rated locker as ok. 4% rated locker and wrestling room to be not clean. Table 8 represents wrestlers' perception of the cleanliness of wrestling facilities.

Table 8

Comparison of cleanliness of facilities

Facility	Clean	OK	Not clean	Total	Clean (%)	OK (%)	Not clean (%)
Training room	25	3	0	28	89	11	0
Locker	8	19	1	28	29	68	4
Weight room	15	13	0	28	54	46	0
Wrestling room	17	10	1	28	61	36	4

All respondents said that they take a shower after the game and they turn in clothes to be washed. Five respondents reported that they take showers before the game and 54% put the towels back in their lockers.

Only 57% of respondents reported having knowledge about MRSA transmission, while 61% said they knew about protection techniques. Forty-three percent said they had had abrasion within last month. Only 58% of those reported they had sought medical attention. Of the entire wrestling team, 32% reported they had had a staphylococcal infection within the past year. Wrestlers' detailed responses is recorded in Table 9. All respondents who had staphylococcal infections were put on antibiotics and all finished the entire course of antibiotics. Eleven percent of respondents reported they had used other facilities besides those provided by the University for wrestling, while 89% used only the wrestling facilities.

Table 9

Staphylococcal Infection

	Yes	No	Yes (%)	No (%)
Abrasion within last month	12	16	43	57
Seek medical attention	7	21	25	75
Knowledge about MRSA transmission	16	12	57	43
Knowledge about protection	17	11	61	39

Discussion

Analysis

The terms *often*, *hardly ever*, and *whenever necessary* were not defined. It was up to the participants' discretion to determine their pattern of washing hands, clothes, bed-sheets, or vacuuming their rooms. It was done to gauge the wrestlers' perception of the necessity of personal cleanliness. Nonetheless, it is highly problematic that 83.3% of wrestlers washing their hands *often* for only 10 seconds. This time frame does not meet the Centers for Disease Control and Prevention (CDC) standards.

Most (79%) of the wrestlers reported washing their hands for 10 seconds while, 18% reported washing only for 5 seconds. Hand-washing is the most effective way of preventing infection. The Centers for Disease Control and Prevention recommends at least 20 seconds of hand-washing, with hands vigorously rubbed, and with special attention paid to the backs of the hands, wrists, between the fingers and under the fingernails (OPRP – Handwashing guidelines, CDC). Only 4% of the wrestlers said they washed their hands for the CDC recommended 20 seconds, which lends an urgency to educate the wrestlers about proper hand washing techniques.

Even though 71% of the wrestlers owned vacuum cleaners, only 7% vacuumed their rooms often. Fifty percent hardly ever vacuumed their room. Despite a majority of participants owning a vacuum cleaner, only a small percentage utilized their resources. Even though only 43% owned personal washer/dryer, wrestlers washed clothes and bed-sheets more often than they vacuumed their rooms. Wrestlers washed clothes more often than bed-sheets. Only 25% reported they washed their bed-sheets often, while 18% reported that they hardly ever wash their bed-sheets. Since both direct (person to person) and indirect (person to

inanimate surface to person) contact can transmit skin infections (Infectious Disease Control, n.d), proper cleanliness including vacuuming and washing clothes is necessary among wrestlers. The study showed that educating wrestlers on this issue is of a concern.

An alarming number of wrestlers did not know about MRSA transmission or protection. Only 61% knew how to protect themselves from MRSA, and only 57% knew how MRSA is transmitted. The wrestlers who reported that they were not knowledgeable about MRSA transmission ranged from freshmen to seniors, and a majority of them reported that they shared personal items. The growing threat of MRSA, the risks associated with the exposed body parts among wrestlers, and the lack of knowledge in a majority of wrestlers about MRSA transmission can result in unexpected consequences. The most effective way of preventing any kind of infection is through awareness of the disease, its mode of transmission, and prevention techniques. The study shows that there is a grave need to create awareness among wrestlers about MRSA.

Sharing personal items was prevalent among wrestlers. Only five (17%) wrestlers reported that they do not share any personal items (uniforms, clothing, towels, razors, deodorants, finger-nail clippers, or pads). Even one of the coaches reported he sometimes shared clothing and towels. Sharing of personal items is probably the easiest way for MRSA transmission from one wrestler to another.

Over two-thirds of wrestlers did not seek medical attention for abrasions. Among wrestlers who did not seek medical attention for abrasion, 7% reported that they did not know about MRSA transmission or protection. A case-control study of a college football team found out that sharing bars of soap and having preexisting cuts or abrasions were associated with infection (Nguyen, Mascola, & Bancroft, 2005). Unknowingly, these

wrestlers' behavior of not seeking medical attention for abrasions could be a source of MRSA transmission.

The information obtained from the Athletic Department reported seven known cases of staphylococcal infection in Fall 2007, while the anonymous survey indicated nine cases. It is evident that there is a discrepancy in reporting the cases. In addition, the Health Center confirmed two cases of MRSA and other suspected staphylococcal infections among wrestlers the same semester, but according to the Athletic department, there are no known cases of MRSA. Because not all wrestlers having staphylococcal infection came to the University's Health Center, and not all suspected cases can afford testing for MRSA, the Health Center was not able to give an accurate number of MRSA cases. However, personal communication revealed that all staphylococcal cases among wrestlers are treated as MRSA cases at this institution.

Wrestlers used the facilities that were previously used by football players. There have been renovations in the existing facilities, and wrestlers felt safe about the new facilities compared to in the old facilities. The exam table surface is cleaned after every player. The whole facility is mopped every week by the housekeeping staff. The restrooms have antibacterial soap, and disinfectant is made available at accessible locations. Wrestlers do not use water bottles which have to be pulled and opened with hands; rather, they use single use cups. The practice room is disinfected between practices. In an effort to prevent staphylococcal infection, protocols have been established for each wrestler. All players were to drop off their clothes every time they practice. The carpets are still old, however, and they can be a breeding ground for the deadly bacteria. The wrestlers' response was overwhelming regarding the cleanliness of locker rooms. When asked to choose the ratings among *clean*,

OK, and *not clean*, most wrestlers rated the cleanliness of lockers as *OK*. There is a dire need for intervention because lockers are one of the major sources of bacteria transmission.

There was no reported case of staphylococcal infection in Fall 2007 among football players after they moved into a newly built football stadium, while the wrestlers using the renovated football facilities experienced an increase in the number of staphylococcal cases. In addition, specific measures were taken to make football players aware of MRSA knowledge and its prevention strategies. This difference should be enough to nudge the concerned authorities to intervene and attempt to reduce staphylococcal cases.

Limitations

The study had several limitations, including the small sample size. Because of the smaller sample size of wrestlers, the sample population cannot be judged as representative of all wrestlers. Practice issues were self-reported and therefore cannot be validated. In addition, the researcher-developed tool was not formally tested for reliability and validity. The study is also limited by the fact that wrestling is a newly reintroduced sport at the university still going through the transition phase. The findings of the study can, however, offer an insight into the perceptions of wrestlers and can be used as a basis of further research.

Conclusion

Methicillin Resistant *Staphylococcus aureus* is a threat to public health as virulent forms of bacteria resistant to antibiotics continue to emerge. Once thought to be a nosocomial infection, MRSA has made its way into the community, infecting crowded settings. Because of its mode of transmission (skin-to-skin contact), the potential for MRSA to become epidemic is fairly high, if proper measures are not taken in a timely fashion. The

CDC is working with local and state health departments to devise action-plans to identify and treat MRSA and protect the public's health. It is, therefore, essential that several public, as well as health professionals, takes the necessary measures that will not only help in curbing the rate of MRSA but also prevent further antibiotic resistance.

In more organized sports, like wrestling, only a collaborative effort can reduce MRSA infections. The cleanliness of facilities, including training room, locker, weight room, and wrestling room, is critical in minimizing staphylococcal transmission from one wrestler to another. Even though concerned authorities can monitor what goes on in the athletic facilities, they cannot monitor athletes' personal lives. The most important thing that makes a difference is educating wrestlers about skin infections and how to protect themselves. The study clearly shows the necessity of MRSA awareness among wrestlers.

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Wrestlers Survey Form

Thank you for participating in this anonymous survey. Please choose the answer that best applies to you.

Age: _____

Year: FR SO JR SR Coach

Living: On-Campus Off Campus

1. Which one of the following items do you share with other players?

- | | | |
|-------------------------------------|-----|----|
| a. Uniforms | Yes | No |
| b. Clothing | Yes | No |
| c. Towels | Yes | No |
| d. Razors | Yes | No |
| e. Deodorants | Yes | No |
| f. Finger-nail clippers | Yes | No |
| g. Pads (shoulder, knee, etc) | Yes | No |
| h. Other items (please list): _____ | | |

2. How often do you wash your hands?

- i. Often ii. Hardly ever iii. When necessary

3. How long do you wash your hands?

- i. 20s ii. 10s iii. 5s

4. What do you use to dry your hands?

- i. Paper towel ii. Dryer iii. I don't dry my hands

5. What kind of water do you use? i. Hot water ii. Cold water

6. Do you use soap when you wash your hands? Yes No

7. Do you have a personal washer/dryer? Yes No

8. Do you have a vacuum cleaner? Yes No
9. How often do you wash the following?
- a. Clothes i. Often ii. Hardly ever iii. When necessary
- b. Bed-sheets i. Often ii. Hardly ever iii. When necessary
10. How often do you vacuum your room?
- i. Often ii. Hardly ever iii. When necessary
11. Rate the cleanliness 1. Clean 2. Ok 3. Not clean
- a. Training room _____
- b. Locker room _____
- c. Weight room _____
- d. Wrestling room _____
12. Do you take shower before the practice/ game? Yes No
13. Do you take shower after the practice/game? Yes No
14. Do you put your towels back in the locker? Yes No
15. Do you turn in all cloths to be washed after every workout? Yes No
16. Did you have abrasion or any type of open lesion within the last month that they were aware of? Yes No
17. Did you seek medical attention for the open lesion? Yes No
18. Do you know how Methicillin Resistant *Staphylococcus aureus* (MRSA) is transmitted?
- Yes No
19. Do you know how to protect yourself from MRSA infection? Yes No

20. Have you had staphylococcal infection within the last year?

Yes No

a. Were you put in antibiotics? Yes No

b. Did you finish the whole regime of antibiotics? Yes No

21. Did you have cold symptoms 2-4 weeks prior to developing the staphylococcal infection?

Yes No

22. Prior to diagnosed infection , have you worked out in any other facilities? Yes No

 If you answered yes to the previous question,

 How long ago? _____

 Please list the facilities _____

23. Athletic department at Liberty University has been upgrading its facilities to help protect players from MRSA infection. Do you feel better protected from staphylococcal infections in the new facility?

24. Any comment/suggestion:
