

SMOKING AND NON-SURGICAL
MRSA SKIN INFECTIONS: IS THERE A LINK?

by

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ABSTRACT

Methicillin-Resistant *Staphylococcus Aureus* (MRSA) skin infections are becoming increasingly common and are the result of nearly 20,000 deaths in the United States each year. Although smoking has been linked to numerous infections including those that occur post-operatively, no one has ever linked the exposure to cigarette smoke to these types of infections. This study intended to examine the relationship between the two. Data was collected from patients in an Emergency Department with a history of non-surgical MRSA skin infections to determine what percentage of them smoked, smoked at the time of their infection or were exposed to smoke on a regular basis. Because of a small sample size and a flawed study design, a statistical analysis was not possible. However, it was discovered that over 63% of those with the infection were exposed to cigarette smoke in one form or another. The remaining 37% were non-smokers or were not exposed to smoke on a regular basis. This indicates there may possibly be a link between the two but more research is needed in the area in order to establish a relationship.

CHAPTER ONE

OVERVIEW

Introduction

Methicillin-Resistant *Staphylococcus Aureus* (MRSA) skin infections are a common problem in the emergency department (ED). Anecdotally, it has been noted that many patients who have such infections smoke cigarettes, are ex-smokers or are exposed to cigarette smoke on a daily basis. This study attempts to document the rate of smoking among those who have non-surgical MRSA skin infections.

Purpose

The purpose of this study was to examine the percentage of patients with non-surgical MRSA skin infections who smoke cigarettes or are exposed to cigarette smoke in a Billings, Montana emergency department.

Background and Significance of the Problem

MRSA infections are becoming increasingly prevalent (Klevens et al, 2007). According to the Agency for Healthcare Research and Quality (AHRQ), the number of MRSA cases in hospitalized patients went from 1,900 in 1993 to 368,600 in 2005 (Elixhauser and Steiner, 2007). McCaig, McDonald, Mandal, and Jernigan (2006), looked at MRSA rates during 2001-2003. They found that the number of physician office visits for MRSA did not change; however, outpatient and emergency department

(ED) visits for the infection increased by 59% and 31%, respectively. The severity of MRSA infections is also increasing. Miller and his colleagues (2005) looked at necrotizing fasciitis, a potentially life-threatening skin infection and found that the current rate in which MRSA is the causative bacterium is increasing at an alarming rate.

The infection is also becoming lethal. Klevens and her colleagues (2007) found that in 2005 there were 18,650 deaths in the U.S. caused by this bacterium. In addition, the authors concluded that invasive MRSA is no longer a hospital problem, but something that affects all members of society. The cost of patient care is increasing as well because of MRSA infections. The Agency for Healthcare Research and Quality (Elixhauser and Steiner, 2007) estimates that a typical hospital stay for a patient with an MRSA infection costs \$14,000 compared to \$7,600 for a patient without such an infection. The length of stay (LOS) also nearly doubles, with the average LOS being 10.0 days for a patient with MRSA and 4.6 days for a patient without.

If smoking is found to be associated with this costly infection, this presents itself as a teaching opportunity for healthcare providers, especially to those who are already at a higher risk than average for getting such infections (Pender, 2006).

Statement of the Problem

Decades of research has found that smoking reduces immune system function, blood flow to the tissues and blood oxygen levels and also increases the risk of post-operative infections. Although cigarette smoking has never been shown to be a factor in MRSA skin infections, it is feasible that a link exists.

Conceptual/Theoretical Framework

The Health Belief Model is to be utilized as the conceptual framework for this study. This model was pioneered in the 1960's and has been used to assist patients and clients in understanding the importance of preventing disease and illness (Pender, Murdaugh and Parsons, 2006). According to this theory, there are many factors which influence peoples' health behaviors. Depending on an individual's demographics (e.g. age, race, ethnicity, etc), sociopsychologic variables such as personality and peer pressure, and other factors such as prior knowledge about a particular disease or illness, the person will have different perceptions as to the threat of the disease. The likelihood of the person changing their behavior to prevent the disease (or infection, in this case), depends on their perception of the benefits (lessened chance of a MRSA infection) and the perceived barriers (quitting smoking). Other factors that may influence the person include advice from others (including healthcare providers), the acquisition of the disease or illness in a person close to them and media attention about the problem.

Evidence has shown that advising patients to quit smoking does indeed increase cessation rates (Lancaster and Fowler, 2009). Helping patients to understand the dangers of smoking is vital. The more evidence the public has about the hazards of smoking, the more ammunition healthcare workers have to convince patients to quit smoking.

Definitions

- Smoking: the inhalation of cigarette smoke (measured in number of packs per day in this study)

- Ex-smoker: one who has smoked cigarettes in the past. This is further delineated as those who smoked at the time of their infection and those who smoked in the distance past (quit >10-15 years ago).
- Passive (or environmental) smoke: the passive inhalation of cigarette smoke in an enclosed space such as a home, casino or bar. For this study, those that smoke themselves are not included in this population. Because there is no risk-free level of exposure and therefore for the purposes of this study, any exposure is considered “exposure” (U.S. Department of Health, Education, and Welfare, 2004).
- MRSA infection: a skin infection that has grown MRSA (community acquired or hospital acquired) in the microbiology laboratory. For this study, infections that were acquired as the results of a surgical procedure were not included. Also, those with a history of a MRSA nasal swabbing were not included, unless they were also found to have a non-surgical wound that was positive for MRSA. Lastly, those patients who were told they “might” have MRSA were not included.

Assumptions

It is assumed that the person being asked about their smoking habits was truthful about their tobacco use and did not under- or over-estimating the amount of cigarettes they smoke. It was also assumed that the person being interviewed was truthful about the amount of passive cigarette smoke they are exposed to. It is assumed that the

microbiology laboratory is correct in their diagnosis of the growth of MRSA from a wound.

Limitations

The major limitation in this study is that the researchers have little control over how truthful participants are regarding their smoking habits or their exposure to cigarette smoke. Also, not all patients with a MRSA infection are seen in the ED and not every non-surgical MRSA patient in the ED was given an opportunity to participate in the study.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

This study attempts to find a link between cigarette smoking and MRSA skin infections. Because smokers are at a higher risk for other infections including tuberculosis and pneumonia (Alcaide, et al. 1996; Almirall, et al., 1999 & Nuorti, et. al., 2000), it is not unreasonable to theorize that smoking can be a causative factor in MRSA skin infections. The biochemical mechanisms that occur as the result of exposure to cigarette smoke are complex and involve many systems within the body including the vascular, integumentary, hematologic and immune systems.

Effects of Smoking on Vascular System

The inhalation of cigarette smoke has many effects on the cardiovascular, cerebrovascular and peripheral vascular systems (Rahman and Laher, 2007). Cigarette smoking “reduces peripheral blood flow and shear stress, contributing to an increased incidence of peripheral arterial disease in smokers” (pg 278). Production of endothelin-1 (ET-1), the isoform of the potent endogenous vasoconstrictor endothelin increases during cigarette smoking, leading to “tissue hypoxemia and decreases in peripheral glucose utilization” (pg 281). These changes could potentially set up tissue such as the skin to infection because of the lack of blood flow to the area.

Vasoconstrictive Effects of Smoking

Smoking also causes tissue ischemia through the effects of norepinephrine, another potent vasoconstrictor released as a result of smoking (Black et al., 2001). The harmful effects of smoking are said to be a result of vasoconstriction and hypoxia (Leow and Maibach, 1998). It is unclear, however, as to the exact mechanism; it has been theorized that the effects may be the result of numerous pathogenic factors, all of which cause vasoconstriction (Mosely and Finseth, 1977). These mechanisms include the inhibition of prostaglandin production, the release of vasopressin, sympathetic nervous system stimulation and alterations in the calcium-mediated process. Based on this research, it is possible that reduced blood flow to the skin could potentially put the tissue at risk for infections such as MRSA.

Effects of Carbon Monoxide on the Body

Carbon monoxide, a byproduct of cigarette smoke, binds to hemoglobin, reducing the amount of oxygen carried to the tissues (Brody & Coburn, 1969; Møller and Villebro, 2009; Sørhaug, Steinshamn, Nilsen & Waldum, 2006, Turner, McNichol & Sillett, 1986). This creates an imbalance between oxygen supply and demand in smokers at the cellular level. Theoretically, a smoker exposed to a pathogen will have less oxygen available to the tissues and the body would be less able to fight off the pathogen, possibly resulting in an infection.

Smoking's Effect on the Immune System

A direct correlation between smoking and infections such as peritonitis, invasive pneumococcal disease, influenza and tuberculosis is well documented (Arcavi and Benowitz, 2004). This is the result of smoking's effect on the immune system. The number of natural killer (NK) cells, crucial in the body's defense against microbial agents, are diminished in smokers compared to that of non-smokers (Stämpfli and Anderson, 2009; Mehta, Nazzal and Sadikot, 2008). Also, cigarette smoking causes T cells to become ineffective when exposed to pathogens and the T cells become ineffective when exposed to pathogens (Mehta, Nazzal and Sadikot, 2008). In addition, cytokines, substances which play a large part in the inflammatory process, are activated in smokers resulting in chronic stress on the immune system (Domagala-Kulawik, 2008). This data suggests that cigarette smoke puts those who are exposed to it at risk for infections such as MRSA. Nicotine also has a negative effect on specific components of neutrophil differentiation. Key steps in the immune process become dysfunctional when nicotine is present (Xu et al., 2008). The body becomes more susceptible to bacterial infections and other diseases as a result. When mice were exposed to cigarette smoke for eight weeks and were subsequently infected with the bacteria *Haemophilus influenza*, various components of the immune process including tumor necrosis factor- α and interleukin-6 were found to be elevated, indicating that the inflammatory response was exacerbated (Gaschler et al., 2009). Cigarettes smoking also markedly weakens the immune system's ability to mount an appropriate response by affecting T- and B-lymphocytes (Zavitz et al., 2008). Again, this evidence supports the theory that cigarette

smoke leads to immune system dysfunction, making the smoker more susceptible to infections such as MRSA.

Risk Factors for MRSA-Related Necrotizing Fasciitis

Infections caused by the bacterium MRSA many times can lead to more serious infections such as necrotizing fasciitis, a skin infection that spreads rapidly, destroying the tissue until the infected area is surgically excised and antibiotics are given. Up to 39% of the cases of necrotizing fasciitis are caused by MRSA (Lee et. al., 2007). As many as 15% of necrotizing fasciitis patients ultimately die from their infection (Lee et al., 2007). Smoking has not been found to be an isolated variable in MRSA related necrotizing fasciitis (Lee et al., 2007) but studies are very limited in the area.

MRSA and Surgery

Smoking has long been a known risk factor for post-operative infections (Myles, Iacono, Hunt, Fletcher, Morris, McIlroy, et al., 2002; Sorenson, Karlsmark, & Gottrup, 2003; Whiteford, 2003). MRSA infections as a causative agent in post-operative infections are also becoming increasingly common (Cowie, Ma, Lee, Smith, & Nsiang, 2005). As many as 27% of patients contract an infection after vascular surgery, 5.4% being found to be caused by MRSA and 3.7% being the result of methicillin-sensitive *Staphylococcus aureus* (MSSA). When risk factors are examined, smoking is an independent factor in MRSA-related post-operative infections after vascular surgeries (Cowie, Ma, Lee, Smith, & Nsiang, 2005) and cardiac surgeries (Peivandi, Kasper-König, Quinkenstein, Loos and Dahm, 2003; Ridderstolpe, Gill, Granfeldt, Ahlfeldt and

Rutberg, 2001). However, not all research has supported these findings (Spelman, Russ, Harrington, Davis, Rabinov, Smith et al., 2000).

MRSA in Newborn Nurseries

MRSA infections of newborns are also becoming increasingly common. When risk factors for such infections were examined, maternal smoking has been found to be an independent variable (Seybold, et al., 2008). Researchers have otherwise not postulated on a causative factor.

Effectiveness of Smoking Cessation Education

According to the Transtheoretical Theory, the potential risks of a particular health habit such as smoking should be explained to patients. But how effective is such teaching on smokers? Research has revealed that with the proper techniques, educating smokers can be a very effective way to get smokers to quit (Rice and Stead 2009). Educating those who have an MRSA skin infection as to the link between smoking and their infection could be a good incentive for them to quit.

CHAPTER THREE

METHODS

Population and Sample

This was a quantitative/descriptive study designed to look at the percentage of patients with non-surgical MRSA skin infections smoked cigarettes or were exposed to cigarette smoke.

Population

Inclusion Criteria. The population included those who have been diagnosed with a non-surgical MRSA skin infection in the past or had a skin infection that was suspicious for MRSA and was to be cultured. There was no age limit to the subjects.

Exclusion Criteria Those that had a MRSA-positive culture from a surgical wound or nasal swab were not included.

Sample

Data was collected over a six month period. Variables included cigarette smoking (packs per day) and/or exposure to cigarette smoke. Having a history of smoking was a variable as well. However, if the patient smoked in the past but quit more than a year prior to the infection, this were excluded as a possible risk factor (CDC, 2009). In addition, living with someone with a MRSA infection and having diabetes was examined. Lastly, the part of the body which was infected with MRSA, the area of the hospital or

clinic in which the MRSA was first discovered and the nature of the infection were all described.

Procedures for Data Collection:

1. IRB approval was obtained.
2. Patients presenting to the Emergency Department of the Billings Clinic who have been previously identified as having a MRSA infection were asked by the primary nurse if they were interested in participating in the study.
3. If the patient (or parent/guardian if it is a child) expressed interest, the study was briefly described and the patient/guardian was given a packet which included a more detailed description of the study, a consent form and a questionnaire. Prior to obtaining consent, participants were informed of the potential benefits and risks of participating in the study. They were also informed that their participation is completely voluntary, that it will not affect their care at the Billings Clinic and that the information will be kept confidential.
4. Once the patient/guardian agreed to participate by signing the consent, they were asked to fill out a questionnaire included in the packet. They also signed a consent which allowed researchers to access their medical records at a later time for such data as having a history of diabetes, when they were diagnosed with the infection and a description of the infection.
5. Consenting participants were asked a series of questions and their answers were recorded. Subjects were asked if they smoke and if so, how much (packs

per day). If they had smoked in the past, they were asked when they did so.

Also, they were asked if they (or the child) are exposed to smoke. Lastly, they were also asked if they live with anyone with a MRSA infection.

6. Once packets from those have consented have been collected, names were changed to numbers and only numbers were used to identify the subjects. Data was collected from the computer system at the Billings Clinic and the source of their infection was determined. If it was from a surgical wound or from a nasal swab, they were excluded from the study and their name was removed from the list. A master list with names and case numbers was kept in a locked file in order to avoid collecting data on a subject more than once. Once all data was collected, the master list with subject names was destroyed.

Instrumentation:

Once the data was collected, the information was entered onto a form which included 1) patients' smoking status, 2) when they smoked (if applicable), 3) if they were exposed to environmental smoke, 4) whether or not they live with someone with a history of MRSA, 5) the date their wound was cultured, 6) the area of the body which was infected, 7) the area of the hospital or clinic to which the patient initially presented and 8) description of the infection. These were documented in order to look for possible patterns.

Discussion of Right of Human
Subjects and Consent Process:

Written consent was obtained prior to collecting data. As described above, they were informed of the risks and benefits of participating, that participation is completely voluntary and that information collected will be kept confidential. They were also told that involvement in this study will not affect their care within the hospital system (hospital, clinic and outlying facilities associated with the Billings Clinic).

Planned Statistical Analysis:

A comparison of non-smokers versus smokers, those exposed to cigarette smoke and those who were smokers at the time of their infection was done. The t-test was to be used in analyzing the data. In addition, descriptive questions, such as where the individual sought medical attention, on what part of the body the infection was and a description of the infection itself was to be examined in order to determine if patterns could be found. For example, if patients described the wound as a “spider bite” and the lesion was later to be found to be a MRSA infection, this may be helpful for other clinicians as something to look for in the future as a possible MRSA infection. Lastly, other patterns to be sought included gender and age.

CHAPTER FOUR

RESULTS

Sample

Data collection took place over the course of six months. Total sample size included 41 participants. However, forty-five packets were returned by the Emergency Department staff. When all of the forms were reviewed for inclusion/exclusion criteria, one form was removed because the patient had filled out the questionnaire twice during the data collection period and three others were not included since they did not meet inclusion criteria. For example, two were infected surgical wounds and one was the result of a cut which was considered a pre-existing wound, similar to that of a surgical incision.

Sample Characteristics

Of the 41 included subjects, 14 (34.1%) were current smokers. Of the 10 subjects who admitted to smoking in the past, six smoked in the distant past (14, 15, 24 and 40 years prior). These subjects were not included as “ex-smokers” since according to the Centers for Disease Control & Prevention (2009), a person’s overall risk for the negative effects of smoking is the same as that of a non-smoker 15 years after they quit. The remaining four (9.76%) smoked at the time of their diagnosis of MRSA (n=3) or smoked in the year prior (n=1). Fifteen of the 41 subjects acknowledged that they were exposed

to cigarette smoke on a daily basis. However, seven of these also smoked themselves and as a result were excluded as “exposed to smoke” leaving eight subjects (19.5%).

Another documented finding included the area in which the patient initially presented with the complaint of the infection. For example, 22 out of the 41 (53.7%) were seen in the Emergency Department (ED), 10 (24.4%) were seen in Same Day Care (SDC), three (7.3%) in the hospital setting, two (2.9%) in Pediatrics, one in the outpatient clinic area (2.4%) and one (2.4%) at the Veteran’s Administration (VA). It was unclear in the medical notes where the remaining two patients were initially seen.

A description of the infection when the patient first presented was also documented. Thirteen were initially described as a “painful” area or as a “sore” (31.7%). Six were described as a “pimple” or “pustule” (14.6%) and four (9.8%) were described as “spider bites” but later were found to be as MRSA infections. Three (7.3%) were said to be a “boil”. The remaining infections were described by the practitioner as “cellulitis”, “swelling” or “an abcess”. One was documented as “a rash” and described as “blisters”.

Patterns of gender and age were also documented. Of the 41 subjects, 21(51.2%) were male and 20 (48.8%) were female. The average age of the subjects was 37.4 years. Six of the subjects were pediatric patients with ages ranging from 2 to 17 years (average age 9.3 years).

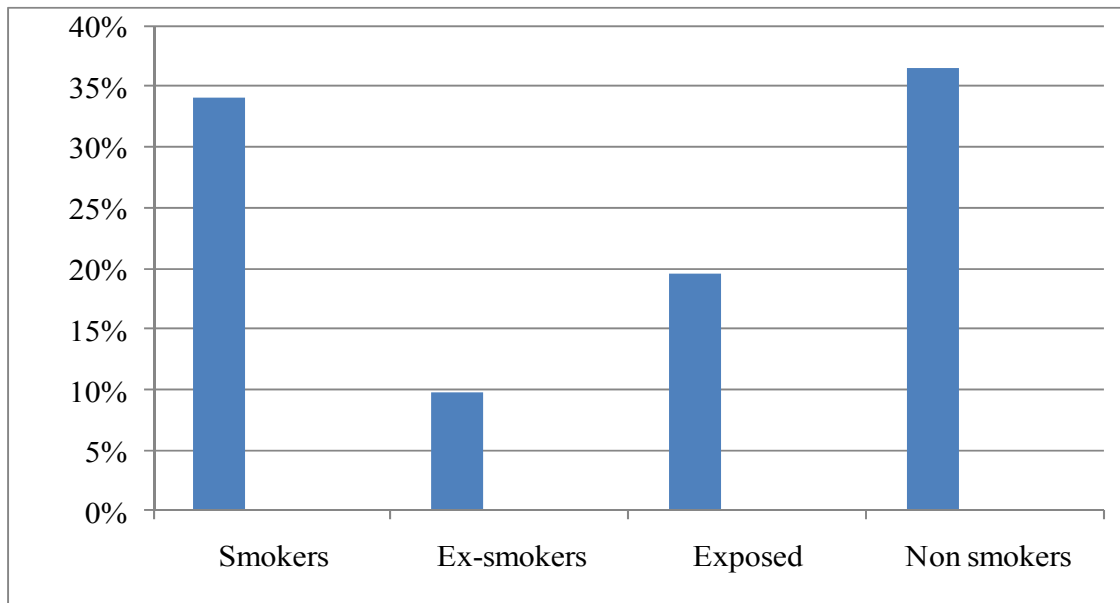


Figure 1. Comparison of Smokers, Ex-Smokers, those Exposed to Smoke and Non Smokers.

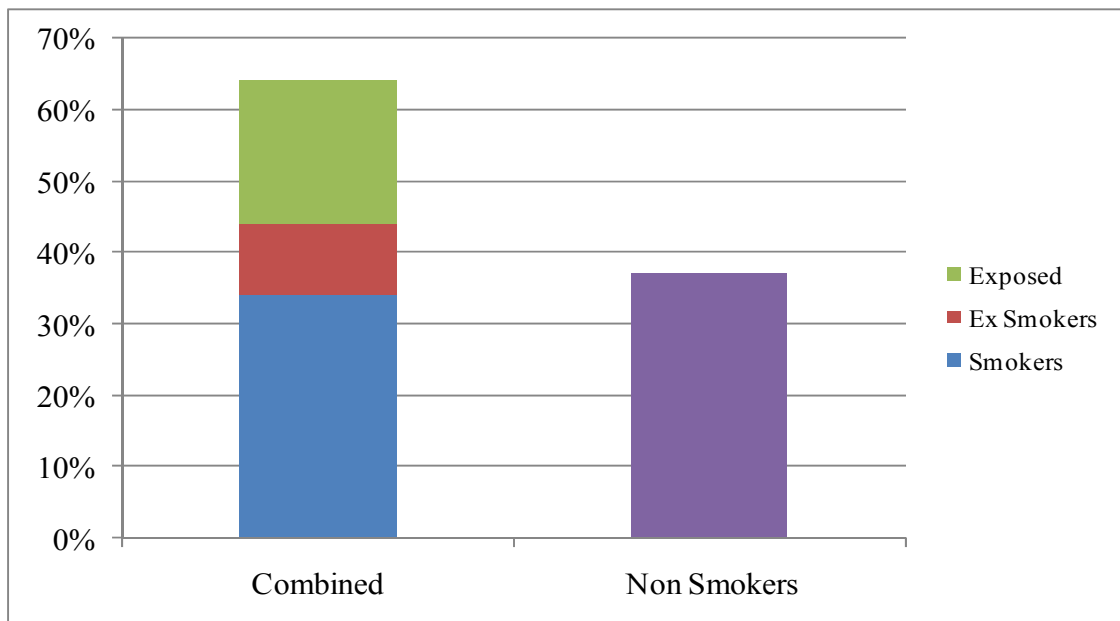


Figure 2. Comparison of Non Smokers to Smokers, Ex-Smokers and those Exposed to Smoke, Combined.

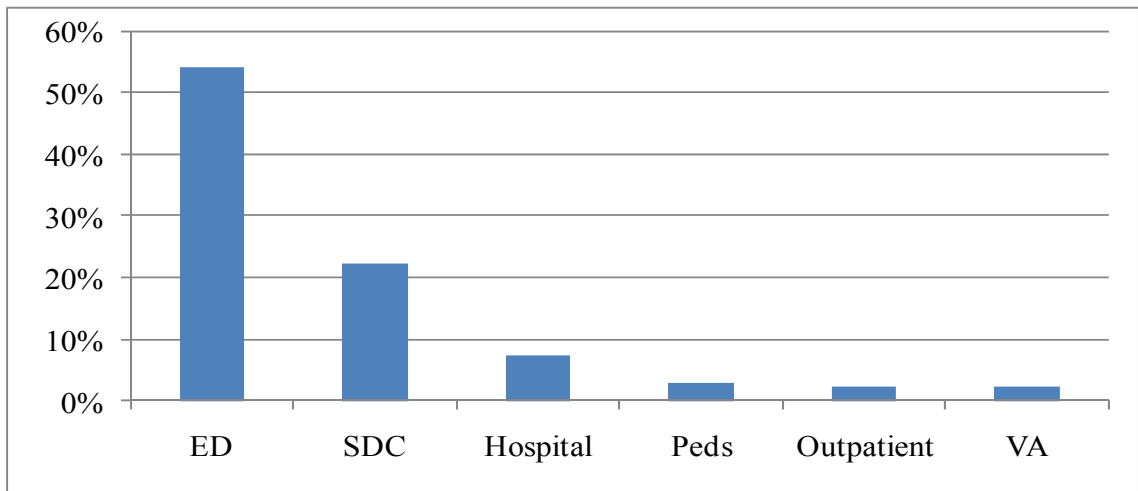


Figure 3. Comparison of Areas Within Facility Where MRSA Was Diagnosed.

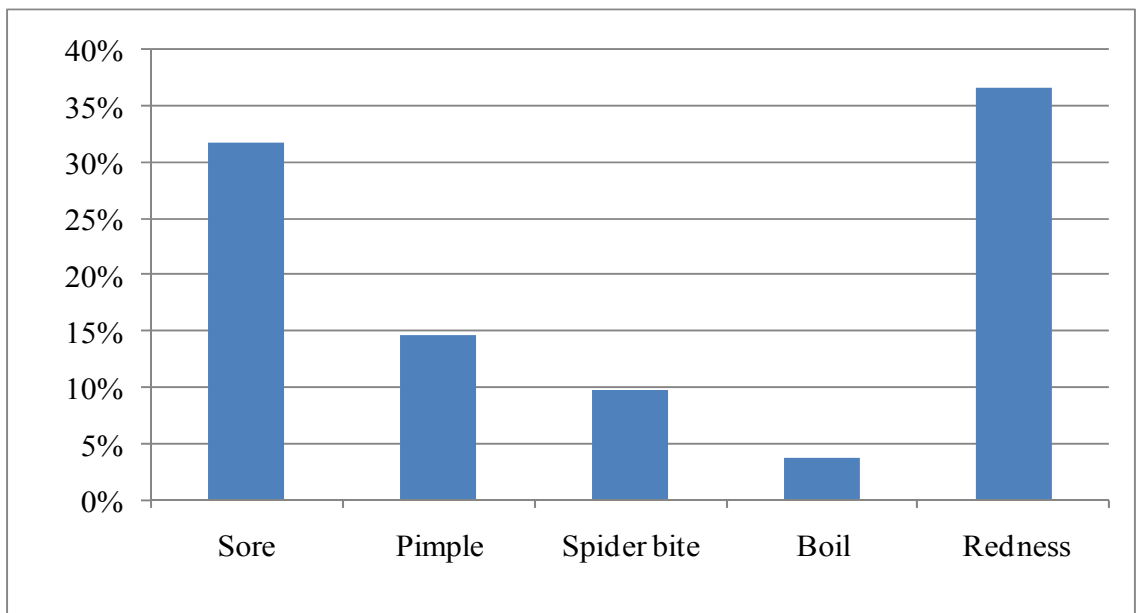


Figure 4. Comparison of Descriptions of MRSA Infection.

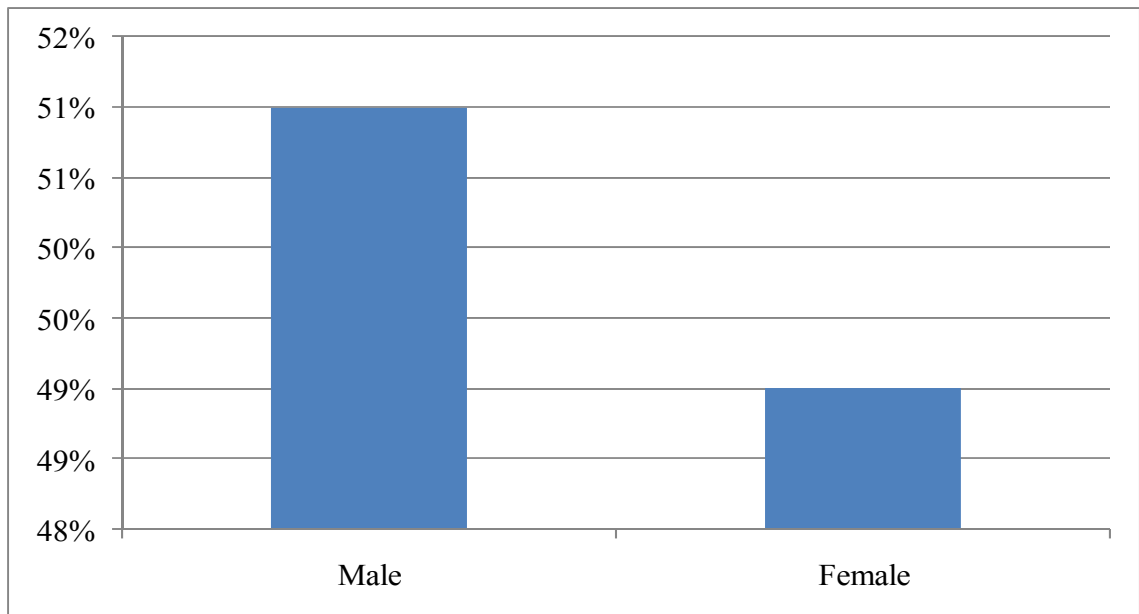


Figure 5. Comparison of Gender Differences.

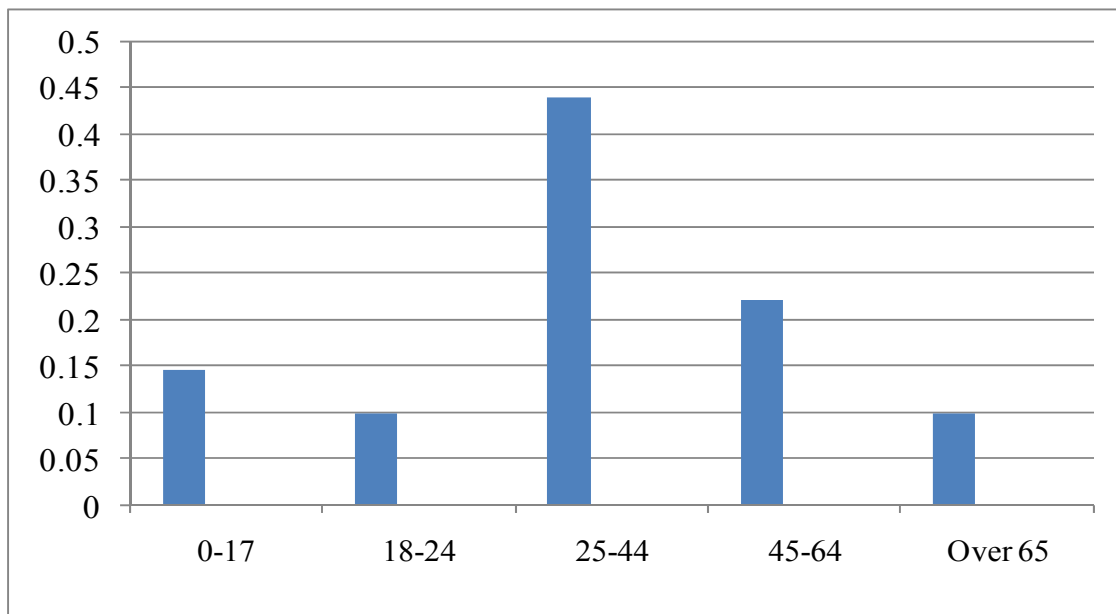


Figure 6. Comparison of Age Differences.

CHAPTER FIVE

DISCUSSION

When the numbers of were totaled, it was found that 63.4% of the MRSA patients in the study were smokers, smoked at the time of their infection but have since quit, or were exposed to cigarette smoke on a daily basis. Although a statistical analysis could not be performed because of the study design and the small sample size, this represents the majority of the MRSA patients in the study.

Limitations within this study include the small number of subjects, potential bias of ED staff to give the study packet to subjects knowing their smoking history beforehand (possibly altering their decision whether or not give the patient a packet), and the possibility that some subjects were not truthful about their cigarette habits.

Although no statistical implications can be made, many clinical inferences can be made. For example, because the majority of those with MRSA were smokers, ex-smokers who smoked at the time of their infection or who were exposed to smoke on a daily basis, it can be said that this may be a factor in the infection, at least in this particular ED. It is interesting to note that 18% of adults smoke in the state of Montana, compared to 64% of these particular set of patients. Those who smoke cigarettes need to understand that a MRSA infection may be a risk they take when they continue their habit. According to the Health Belief Model, such knowledge is one tool practitioners can use to assist patients in preventing disease and illness such as MRSA infections.

Other interesting findings included the location in which the infection was first diagnosed. For instance, over half (53.7%) were found in the ED. Same Day Care was second, being the site in which one-quarter of the cases were diagnosed. The remaining infections include the hospital setting (7.3%) and outpatient areas (7.7%). It can be concluded from this that MRSA infections are commonly diagnosed in the ED and SDC and are comparatively less common in the inpatient and clinic settings. Practitioners in the former locations need to be aware of the high incidence of MRSA infections in their areas.

The description of the infections when they first presented is another variable that should be noted. Pain was a common symptom, with “painful area” or “sore” being described in 31.7% of the cases. This is something that clinicians should be aware of when determining whether or not an infection is MRSA. Another, albeit not unexpected, finding was the incidence of infections being described as a “pimple” or “pustule”. Anecdotally, this is a common finding in the ED. In this study, this description was found in 14.6% of the MRSA cases. Similarly, such infections are many times called “spider bites” by patients prior to the discovery of MRSA (Moran, Amii, Abrahamian & Talan, 2005); nearly 10% of cases were described in this way. The remaining infections were found to be labeled as “a boil”, “cellulitis”, “swelling” or “an abcess” and one was described as a rash.

Other factors were examined in order to find patterns among MRSA patients. The literature has found diabetes was one such variable in post-operative wound infections (Spelman, Russo, Harrington, Davis, Rabinov, Smith et al., 2000). In the current study, it

was found that 12.2% of the MRSA patients had a history of diabetes. It is interesting to note that none of these patients smoked or were exposed to cigarette smoke.

Unfortunately, little can be said about how this can be interpreted.

Gender was another variable that was examined. The breakdown of males to females was almost exactly half and half (51.2% and 48.8%, respectively).

Ages of the patients were also compared. Most were between the ages of 25 and 44 (43.9%), with the next largest group being between 45 and 65 (22%). Next were pediatric patients at 14.6% and the smallest group were those greater than 65 at 9.7%.

The youngest patient was two years of age and the oldest was 78. The average age of the MRSA patient was 37.4 years. From this study, it appears that the average MRSA patient is a young adult.

Areas for future research include using a larger sample size and altering the study design to include those with non-MRSA skin infections in order to compare MRSA infections with non-MRSA infections. As a result, a statistical analysis such as a t-test could be performed to compare the two. This would attempt to find a link between smoking and any spontaneous skin infection such as cellulitis.

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APPENDICES

APPENDIX A

MONTANA STATE UNIVERSITY
IRB APPROVAL LETTER

INSTITUTIONAL REVIEW BOARD

For the Protection of Human Subjects



960 Technology Blvd. Room 127
c/o Veterinary Molecular Biology
Montana State University
Bozeman, MT 59717-3080
Telephone: 406-994-6783
FAX: 406-994-4303
E-mail: cherylj@montana.edu

Chair: Mark Quinn
406-994-5721
mquinn@montana.edu
Administrator:
Cheryl Johnson
406-994-4706
cherylj@montana.edu

MEMORANDUM

.....

TO: Susan Finn

FROM: Mark Quinn *Mark Quinn CJ*
Chair, Institutional Review Board for the Protection of Human Subjects

DATE: October 7, 2009

SUBJECT: *Is There a Relationship between Smoking and Non-Surgical Methicillin-resistant Staphylococcus aureus (MRSA) Skin Infections?* [SF100709]

The above proposal was reviewed by expedited review by the Institutional Review Board. This proposal is now approved for a period of one-year.

Please keep track of the number of subjects who participate in the study and of any unexpected or adverse consequences of the research. If there are any adverse consequences, please report them to the committee as soon as possible. If there are serious adverse consequences, please suspend the research until the situation has been reviewed by the Institutional Review Board.

Any changes in the human subjects aspects of the research should be approved by the committee before they are implemented.

It is the investigator's responsibility to inform subjects about the risks and benefits of the research. Although the subject's signing of the consent form, documents this process, you, as the investigator should be sure that the subject understands it. Please remember that subjects should receive a copy of the consent form and that you should keep a signed copy for your records.

In one year, you will be sent a questionnaire asking for information about the progress of the research. The information that you provide will be used to determine whether the committee will give continuing approval for another year. If the research is still in progress in 5 years, a complete new application will be required.

APPENDIX B

SUBJECT CONSENT FORM FOR PARTICIPATION IN
HUMAN RESEARCH AT MONTANA STATE UNIVERSITY

SUBJECT CONSENT FORM
FOR
PARTICIPATION IN HUMAN RESEARCH AT
MONTANA STATE UNIVERSITY

Project Title: Is There a Relationship Between Smoking and Non Surgical Methicillin Resistant *Staphylococcus Aureus* (MRSA) Skin Infections? Are There Any Co Morbidities Associated with Non Surgical MRSA Skin Infections?

You are being asked to participate in a study being done by Susan Finn, a graduate nursing student at Montana State University. The study is looking to see if there is a connection between smoking and MRSA skin infections. MRSA is a bacterium that is very resistant to many antibiotics and is quickly becoming a health problem for many people.

By participating in this study, you will be helping researchers to expand their knowledge of such infections and what puts people at more risk for getting them.

If you agree to participate, you will be given a questionnaire which is included in this packet. You will be asked about whether or not you smoke and if you do, how much. If you used to smoke and quit, you will be asked when you did so. You will also be asked if you are exposed to smoke such as in the home, at work or in a bar or casino and if you live with someone with a MRSA infection.

Later, a researcher will need to access your medical record to determine the source of your infection. Because we are interested in only certain MRSA infections, it is necessary to find out where the MRSA infection came from. Also, researchers may attempt to find other risk factors for MRSA infections such as diabetes, heart disease and peripheral vascular disease. By signing the below consent form, you are agreeing to let us access your records for just these purposes.

There are no risks in participating in this study nor are there any potential benefits to you. Whether or not you participate will not affect your care at the Billings Clinic. The information will be kept completely confidential. Once you agree to participate, your name will be deleted from our forms and will be changed to a number. Your name will be on a master list which will be kept in a locked file and destroyed once the study is finished.

Potential benefits include helping researchers determine if people that smoke or are exposed to smoke are more likely to get a MRSA infection.

There are no costs involved in participating. Also, there is no funding associated with this study.

APPROVED
MSU IRB
10/07/2009
Date approved
10/06/2010
Expiration date

APPENDIX C

AUTHORIZATION TO SHARE PERSONAL
INFORMATION IN RESEARCH

AUTHORIZATION TO SHARE PERSONAL HEALTH INFORMATION IN RESEARCH

We are asking you to take part in the research described in the attached consent form. To do this research, we need to collect health information that identifies you. We will collect the results of tests, questionnaires and interviews. We may also collect information from your medical record. We will only collect information that is needed for the research. This information is described in the attached consent form. For you to be in this research, we need your permission to collect and share this information.

We may share your information with other researchers outside of the hospital including those who are in charge of the research or work with us on the research. Some of these people make sure we do the research properly.

If you sign this form, we will collect your health information until the end of the research. We may collect some information from your medical records even after your direct participation in the research project ends. We will protect the information and keep it confidential.

Your information may also be useful for other studies. We can only use your information again if the Institutional Review Board gives us permission. This committee may ask us to talk to you again before doing the research. But the committee may also let us do the research without talking to you again if we keep your health information private.

If you sign this form, you are giving us permission to collect, use and share your health information. You do not need to sign this form. If you decide not to sign this form, you cannot be in the research study. You need to sign this form and the attached consent form if you want to be in the research study. We cannot do the research if we cannot collect, use and share your health information.

If you change your mind later and do not want us to collect or share your health information, you need to email the researcher (email address listed below), call her (phone number listed below) or send a letter to the researcher listed on the attached consent form. The letter needs to say that you have changed your mind and do not want the researcher to collect and share your health information. You may also need to leave the research study if we cannot collect any more health information. We may still use the information we have already collected. We need to know what happens to everyone who starts a research study, not just those people who stay in it.

APPROVED
MSU IRB
10/07/2009
Date approved
10/06/2010
Expiration date

APPENDIX D

RESEARCHER CONTACT INFORMATION

If you have questions about the study, or if you no longer wish to participate in the study, please email Susan Finn at susan.voight@msu.montana.edu. You can also call her at 406 435-5560 (leave a message).

Or you may write to her at:

Susan Finn
C/O Karen Zulkowski, DNS, RN, CWS
Apsaruke Hall
1500 University Dr.
Billings, MT 59101-0251

APPROVED
MSU IRB
10/07/2009
Date approved
10/06/2010
Expiration date

APPENDIX E

CONSENT FORM TO BE SIGNED
BY SUBJECT OR GUARDIAN

For one's own participation:

"AUTHORIZATION: I have read the above and understand the discomforts and risk of this study and I _____ (name of subject), agree to participate in this research. I also agree that my health information can be collected and used by the researchers and staff for the research study described in this consent form. I understand that I may later refuse to participate and that I may withdraw from the study at any time. I have received a copy of this consent for my own records.

Signed: _____

Witness: _____

Investigator: _____

Date: _____ "

For the participation of a child or other person who is not able to give consent for themselves (someone who cannot read or is otherwise incompetent):

"AUTHORIZATION: I have read the above and understand the discomforts and risk of this study and I _____ (name of parent or guardian), related to the subject as _____ (relationship), agree to the participation of _____ (name of subject) in this research. I also agree that their health information can be collected and used by the researchers and staff for the research study described in this consent form. I understand that the subject or I may later refuse participation in this research and that the subject, though his/her action or mine, may withdraw from research at any time. I have received a copy of this consent for my own records.

Signed: _____

Witness: _____

Investigator: _____

Date: _____ "

APPROVED
MSU IRB
10/07/2009
Date approved
10/06/2010
Expiration date

APPENDIX F

QUESTIONNAIRE

Questionnaire

1. Do you smoke cigarettes? Yes _____ No _____
 - a. If so, how many packs per day? _____ packs/day
2. If you do not smoke now, did you in the past? Yes _____ No _____
 - a. If so, how long ago? _____ mo/yrs ago
3. Are you (or the child) exposed to cigarette smoke on a daily basis? Yes _____ No _____
 - a. What kind of exposure? Bar or casino _____ Home _____ Other _____
4. Do you live with anyone who has or had a MRSA infection? Yes _____ No _____
 - a. If so, do they smoke? Yes _____ No _____