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The Prevention and Management of Hospital Acquired Infections

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THE PREVENTION AND MANAGEMENT OF HOSPITAL ACQUIRED INFECTIONS

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HONORS THESIS

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ABSTRACT OF THESIS:
Hospital acquired infections, or HAIs, appear in patients during treatment and are unrelated to the original illness. These infections occur at least 48 hours after hospital admission or 30 days after discharge. With over 700,000 individuals directly affected by HAIs, more attention needs to go into prevention and surveillance. It has been reported that some health care facilities have reduced HAIs by up to 70%. However, this will take a conscious effort from all healthcare facilities, care teams, physicians and nurses. Some possible solutions include infection prevention, increasing surveillance, and improving staff education and accountability. Despite these efforts, no institution or country can eliminate this issue. In order to gain a better understanding of the preventative side of HAIs, I observed five physicians to see if they adhere to proper hand hygiene, use of personal protective equipment, and overall safe practices. After completing my study, results show that more attention must go into hand hygiene, specifically after removal of PPE and leaving patient rooms. This study could explain the increase of HAIs in the latest progress report from the Centers for Disease Control and Prevention; however, results are inconclusive due to the small sample size and lack of accurate statistical methods.

Key Words: Hospital acquired infections, healthcare, prevention, surveillance, hygiene, Centers for Disease Control and Prevention.

LIST OF TABLES AND FIGURES

CHAPTER I: INTRODUCTION

WHAT ARE HOSPITAL ACQUIRED INFECTIONS?

Hospital acquired infections (HAIs) refer to infections associated with the delivery of healthcare in hospitals, long-term facilities, home care, ambulatory settings, and other clinical environments. HAIs are unrelated to the original illness and are defined to appear 48 hours or more after hospital admission or within 30 days from discharge.[4] These infections are the most frequent adverse event in health care delivery worldwide, leading to multiple cases of morbidity and mortality.

EMERGENCE OF HOSPITAL ACQUIRED INFECTIONS

The emergence of HAIs dates back centuries ago; however, wide-scale recognition of the problem did not come about until the 1950s when penicillin-resistant *Staphylococcus aureus* infections caught the public's attention. Unfortunately, this issue was taken lightly until it became an epidemic. Ten years later, hospitals in the United States began hospital-based

infection control, and later in the 1990s, HAI control programs were established in virtually all hospitals across the nation.

Although the emergence of HAIs are unknown, there are many explanations to how they came about and are still thriving to this day. The first problem is that hospitalized patients tend to be more susceptible to infections due to their weakened immune systems. Second, because they are usually grouped together in confined areas of the hospital, the exchange of infections can occur more frequently between individuals. Third, staff members must move quickly from one patient to another, allowing cross contamination to occur if standard regulations are not met. Other explanations for the emergence of HAIs include the use of medical procedures that bypass the body's natural protective barriers, improper sterilization of equipment, routine use of antimicrobials allowing for the emergence of resistant strains, and inadequate sanitation protocols regarding washing of hands and self. Despite these reasons, the rise of these infections can be easily reduced if healthcare providers and patients put in the extra effort. If done correctly, hand hygiene can help decrease the spread of HAIs by a significant amount. Because the hands are the main pathway for contact transmission of pathogens in healthcare, proper hand hygiene is an important measure to help avoid and prevent the spread of HAIs. Some factors that contribute to poor

compliance of hand hygiene include lack of knowledge, understaffing, overcrowding of patients, poor access to hand washing or sanitizing facilities, irritant contact dermatitis of clinicians' hands, and lack of organizational commitment to appropriate hand hygiene.

STATEMENT OF THE PROBLEM

Despite efforts, no institution or country has been able to solve this issue. Current data shows that on any given day, 1 in 25 hospitalized patients will acquire at least one HAI and 1 in 9 patients with an HAI will die during their hospitalization.[5] Because hospitals are an ideal breeding ground for pathogens, these surroundings make it even more difficult to solve this issue. Therefore, it is significant for physicians to follow the recommended procedures to help reduce the occurrence of HAIs.

SIGNIFICANCE OF THE STUDY

Stated earlier, HAIs are the most frequent adverse event in healthcare worldwide and create numerous problems and risks to patients affected. The impact of HAIs include additional suffering to the individual, expensive treatments leading to high medical costs, expensive surveillance, prolonged hospital

stays, long-term disability, increased resistance to antibiotics, and unnecessary deaths. The most recent study from the CDC in 2011 shows than an estimated 722,000 individuals were affected by HAIs in acute care hospitals in the United States.[5] Of these cases, 99,000 resulted in death.[4] In 2009, the annual direct medical cost of HAIs in the U.S. ranged from 28-45 billion dollars.[4]

The HAI type that causes the highest morbidity and mortality is ventilator associated pneumonia, or VAP.[2] This infection is one of the top three concerns of clinicians today and can account for up to 60% of all deaths from HAIs in the U.S.[2] If death does not occur, VAP can increase patient time in the intensive care unit by four to six days and is estimated to generate increased medical costs of 20,000 to 40,000 dollars.[2] VAP is an increasing concern world-wide, as there is evidence of an increase of transmission in ICU patients in Germany, France, and the United Kingdom.[2] Because there is a great risk of pneumonia in patients receiving continuous ventilation, most of the research on HAIs have been focused on VAP.

Another major site of infection that affects around 158,000 out of 722,000 HAI infected patients are surgical site infections.[5] Any breach of skin can lead to a surgical site

infection. These invasive procedures can then lead to additional or extended treatment, resulting in up to 10 billion dollars in treatment costs every year in the U.S. alone.[2]

In addition to these concerns, there are many factors that put patients at risk for HAIs. First, distinct settings create specific patient populations. The risk of acquiring HAIs in developing countries is 2 to 20 times higher than in developed countries.[2] Therefore, factors that place patients at greater risk for HAIs in settings with limited resources can include poor environmental hygienic conditions and waste disposal, poor infrastructure, insufficient equipment, understaffing, overcrowding of patients, poor knowledge and application of basic infection control measures, lack of procedure, lack of knowledge of injection and blood transfusion safety, and absence of local and national guidelines and policies.[3] In developed countries, the factors that put patients at greater risk consist of prolonged or inappropriate use of invasive devices and antibiotics, high risk procedures, weakened immune systems, and inappropriate application of standard isolation precautions.[3] When looking at overall circumstances that place a patient at risk, one could examine patient characteristics (age and/or underlying conditions that compromise the immune system), presence of invasive medical devices (catheters, breathing

tubes), complications from surgical procedures, and antibiotic use.[3]

Another factor contributing to HAIs are antibiotic resistant microorganisms, particularly bacteria. Overuse of medication can promote the emergence of antibiotic resistant organisms that cause these infections and limit treatment options. Studies show that up to 50% of antimicrobial use in hospitals is unnecessary, inappropriate, and contribute to the overgrowth of resistant *Clostridium difficile* infections.[5] *C. difficile* infections are currently at historically high levels and can cause severe diarrhea, fever, and abdominal pain.

CHAPTER II: REVIEW OF RELATED LITERATURE AND STUDIES

PREVENTION

Research shows that HAIs are often preventable and can be reduced by up to 70%.[5] However, this requires training and discipline by all health care providers. Several organizations have examined ways to prevent HAIs, including through the creation of recommendation lists for clinicians to follow. The organizations examined include the National Centers for

Biotechnology Information, Centers for Disease Control and Prevention and the Healthcare Infection Control Practices Advisory Committee.

According to the NCBI, six steps are recommended to reduce HAIs by 30%.[4] First, it is necessary to maintain improvement in national surveillance of HAIs so there is accurate representative data for studies. In order to do this, researchers must assess the sensitivity and specificity of the surveillance, and they also need to create systems for surveillance of HAIs that occur outside of hospitals. Second, surveillance uses need to be valid, and followed by increased outpatient surveillance. Third, invasive designs must be improved, as it is easier to change than human behavior in regard to proper hand washing for example. Fourth, creation of aggressive antibiotic control programs which can be used to limit and prevent antibiotic resistance are needed. Fifth, emphasis is needed of the importance of new microbiologic methods, which will help to provide a better understanding of the factors that lead to the emergence of resistant strains. And last, control of tuberculosis in hospitals, which exemplifies the successful collaboration of the infection control community, CDC and regulatory agencies, is mandatory.

The CDC follows similar steps when observing the problem as a whole; however, Director Julie Gerberding stresses the importance of preventative steps maintained by all health professionals. These preventative solutions include the topics of hand hygiene, cross contamination, methicillin-resistant *Staphylococcus aureus*, ventilator associated pneumonia, and surgical site infections. In regard to hand hygiene, the focus is better knowledge and understanding of proper hand washing and sanitizing. When hand washing, soap and water must be used when hands are visibly soiled or have bodily fluid contamination. This will help to physically remove germs and to rinse them down the drain, out of patient contact. When hands are not visibly soiled, sanitization can be used for decontamination through the use of alcohol-based hand rubs. The next precaution is to avoid cross contamination, which is stated by the CDC as the number one source of HAIs. Dr. Gerberding asserts, "Clean hands are the single most important factor in preventing the spread of dangerous germs and antibiotic resistance in healthcare settings.[2]" In order to prevent this cross contamination, personal protective equipment must be available during patient contact; however, the use of PPE does not eliminate the need for hand hygiene. Gloves are able to reduce hand contamination by 70-80%.[2] These, when used along with other PPE and hand hygiene, can create the first line of defense in preventing the spread of

infection from person to person within healthcare settings. Consequently, PPE can be used adversely as a source of contamination, commonly through methicillin-resistant *Staphylococcus aureus*. MRSA is a member of the common *Staphylococcus* family of infections. Infections caused by this bacterium were treated successfully in the 1940s by penicillin; however, the pathogen has become increasingly resistant to treatment. In the span of 30 years, MRSA infections increased from 2% to 63% of the total number of *Staphylococcus* infections.[2] In 2005, 85% of life threatening MRSA infections were associated with healthcare settings.[2] The reason for such a high percentage is because of the easy transmission between individuals, equipment, and environmental surfaces. In addition, MRSA is able to survive and divide on virtually all surfaces. For these reasons, the CDC emphasizes the factors that must be taken into consideration when wearing gloves and/or gowns (Table 1).[2]

Table 1: Guidelines for Use of Personal Protective Equipment	
Gloves should be…	Worn when in contact with mucous membranes and non-intact skin (blood, bodily fluids, secretions and excretions).

	Selected with appropriate durability for the task at hand.
	Changed between patients, tasks, and procedures on the same patient after contact with possibly infected material.
	Removed promptly after use and before touching non-contaminated items or surfaces (followed by hand hygiene).
	Worn for all contact with patients known or suspected to be infected with MRSA.
Gowns should be…	Worn to protect skin and prevent soiling of clothing during procedures and patient care activities when exposed with blood, bodily fluids, secretions, and excretions.
	Selected accordingly to the patient care activity, removed promptly if soiled and hands cleansed thoroughly after removal.
	Worn for all contact with patients known or suspected to be infected by MRSA.

The next approach mentioned by the CDC is to challenge the problem of ventilator associated pneumonia. Because VAP is a

global issue and is known to be the highest source of morbidity and mortality of all HAIs, prevention requires collaboration between the CDC and the American Thoracic Society to develop the following guidelines (Table 2).[7] This table explains guidelines adapted from both organizations in regard to management of adults with hospital acquired, ventilated-associated, and healthcare-associated pneumonia.

Table 2: Recommendations for Prevention of Ventilator Associated Pneumonia via the Centers for Disease Control and Prevention and the American Thoracic Society
1) Perform hand hygiene before patient contact or aseptic procedure, after patient contact, contact with the care environment or bodily fluids (regardless of glove use).
2) Wear gloves, gowns, and face protection following standard and transmission-based precautions as clinically indicated.
3) Make comprehensive patient oral hygiene standard practice.
4) Keep patient head of bed elevated above 30° unless against the advisability of treatment.
5) Use a closed-suction system or sterile single-use suction catheter.
6) Minimize saline lavage.
7) Prevent patient contamination from ventilator circuit condensate.
8) Perform oral and subglottic suctioning when necessary.
9) Avoid nasal placement of endotracheal (ET) or gastric tubes and consider non-invasive breathing support methods whenever possible.

10) Maintain optimal pressure in ET tube cuff while patient is intubated.
11) Avoid unnecessary manipulation of ET tube.
12) Remove ET tube as early as possible, but avoid inadvertent extubation or re-intubation.
13) Prevent cross-contamination with reusable devices and common-use patient equipment.
14) Vaccinate staff and patients against influenza.
15) Utilize methods for early diagnosis of VAP.
16) Write patient care policies, educate staff and monitor compliance.

Doctors and organizations have also looked at how to limit surgical site infections (SSI). Any breach of skin can lead to an SSI. Out of 30 million surgical procedures performed in the U.S., 80,000 result in SSIs.[2] In relation to healthcare-associated infections in surgical patients, about 38% of them are SSIs.[2] The common causes of these infections include complications from surgical hypothermia, contamination of the incision area by skin flora, bacteria cross-contamination, and surgical instrument contamination. Without prevention, SSIs can increase the patient's length of stay by an average of 7.5 days and result in up to 10 billion dollars in medical costs every year in the U.S.[2] Below in Table 3,[2] the CDC explains methods that patients and health professionals should follow to stay a step ahead of SSIs. For more details on SSI prevention,

additional recommendations can be found on the Centers for Disease Control and Prevention webpage under SSI Prevention Guidelines in Category IA.

Table 3: Recommendations for Prevention of Surgical Site Infections via the Centers for Disease Control and Prevention
1) Use antibiotics appropriately.
2) Maintain normal body temperature.
3) Maintain normal blood glucose levels.
4) Control blood glucose in all diabetics and maintain postoperative glucose control for major cardiac surgery patients.
5) Avoid shaving surgical site. Use clippers is necessary.
6) Have an informed surgical team working in a safety culture.
7) Identify and treat any pre-existing infections
8) Encourage patients to stop smoking as soon as surgery is anticipated.
9) Maintain perioperative normal body temperature for colorectal surgery patients.
10) Educate patients on proper incision care and prompt reporting of signs indicating possible SSI.

TREATMENT CONSEQUENT TO INFECTION

The treatment of HAIs varies depending on the type of infection, the pathogen involved and the medical history of the

patient. Generally, treatment consists of administering antibiotics at the right dosage and duration. Evidence shows that early antibiotic treatment leads to better outcomes in regard to morbidity and mortality.[4] Empirical use of antibiotics is usually necessary, as most laboratory results take a minimum of 48 hours. After results are in, a narrow-spectrum antibiotic can be used. Indicators for an effective treatment are often measured by the patient's temperature, leukocyte count, C-reactive protein and procalcitonin.

POSSIBLE SOLUTIONS

Today, solutions are being viewed through many perspectives. One point of view focuses on the responsibility of healthcare providers and their role in preventative care. Standardized regulations have been made to ensure proper hand hygiene, disinfection of equipment and environment, and correct application during all procedures. Another aspect focuses on research at the national level. The Centers for Disease Control and Prevention and the World Health Organization play a huge role in this, as the CDC publishes yearly progress reports to better target the issue and WHO helps to reduce HAIs globally through their "Clean Care is Safer Care" program.

ROLE OF CENTERS FOR DISEASE CONTROL AND PREVENTION

In order to publish reports on the prevalence of HAIs, the CDC asks all health care facilities to collect and submit data related to HAIs and prevention. Since 2008, the CDC has been using a combination of data systems, public health-healthcare programs, evidence-based recommendations and partnerships.[3] Because there is no solution for preventing HAIs, the CDC focuses its efforts on major device-and procedure-related HAIs, along with controlling the spread of infections. When creating yearly progress reports (Figure 1)[6], data is pooled from two sources: The National Healthcare Safety Network (NHSN) and the Emerging Infections Program Healthcare-Associated Infections Community-Interface (EIP HAIC). The NHSN is the nation's most used system to track HAIs, helping to better target the concerns of these infections. After results are produced, gaps are identified where more interventions are needed. In 2012, this method was able to identify the emerging threats of *C. difficile and* Carbapenem-resistant Enterobacteriaceae. When developing approaches to HAI prevention, the CDC collaborates with research partners to identify and test new strategies for prevention, control, and clinical practice. When prevention measures work, results are communicated and promoted to all public health communities to show hospital CEOs and medical officers ways to

improve antibiotic use and protection of patients in their facilities. In order to report accurate findings, the CDC constantly looks for ways to expand their collaborations. When working with diverse public health and healthcare partners, they are able to align prevention goals, promote the use of CDC guidelines and data, and combatively work to prevent HAIS across the spectrum of care.

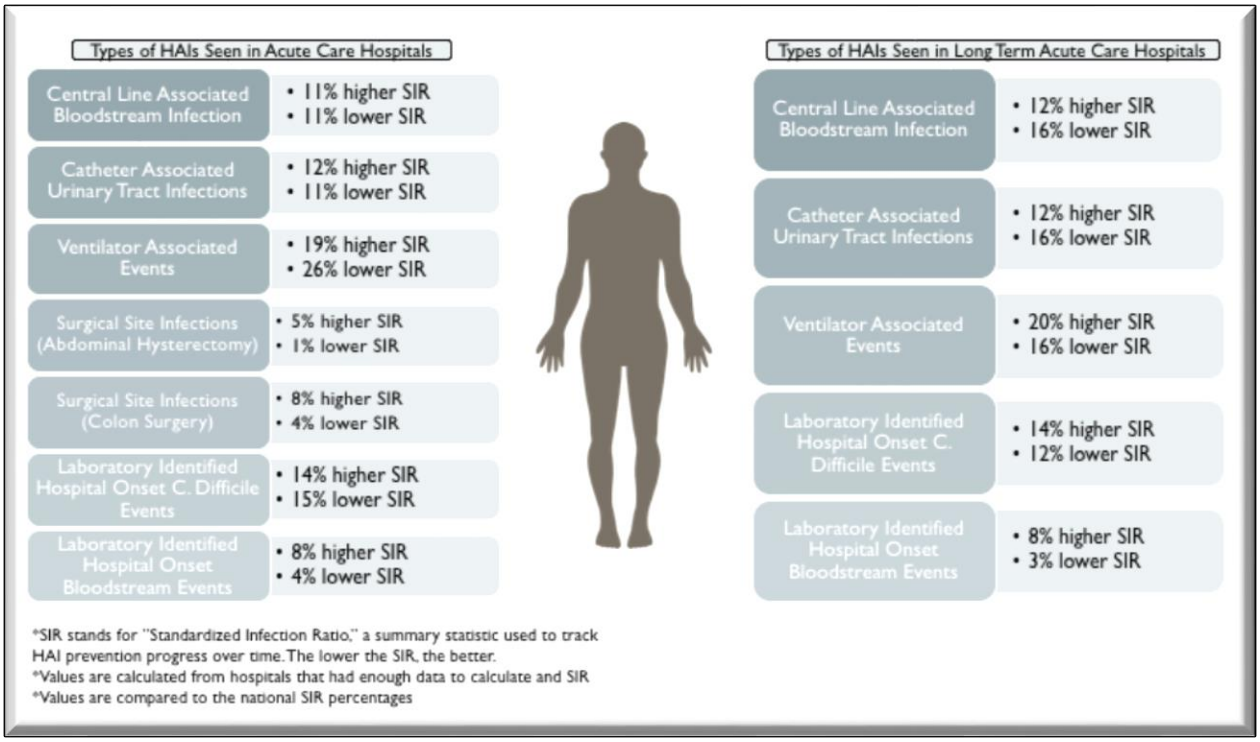

Figure 1: National Progress Report of Acute and Long-term Care Hospitals in 2015

INFECTION CONTROL AND PREVENTION IN PHYSICIAN OFFICES

Because billions of visits are made to hospitals each year, it is significant for infection control and prevention to begin

at the source. Some general infection control recommendation by the CDC for physicians include the following: protocol within physician offices and clinics should mirror the same standards as a hospital, administration should include equipment and supplies to maintain proper infection prevention, the practice should have at least one individual on staff trained in infection prevention, and infection prevention policies should be reassessed on a regular basis.[1] If these recommendations are not taken into consideration, the least that should occur in all patient care are standard infection precautions, or the minimum infection prevention practices. Standard precautions created by the CDC include hand hygiene, use of personal protective equipment, safe injection practices, safe handling of potentially contaminated equipment or surfaces, and respiratory hygiene. Explanations of proper hand hygiene and PPE protocols are noted in my thesis.[8] In regard to injection safety, many steps need to be taken into consideration to ensure safe practice. The following recommendations for safe injection practices are noted below in Table 4.[1]

Table 4: Recommendations for Safe Injection Practices
1) Use aseptic technique when preparing and administering.
2) Cleanse the access diaphragms of medication vials with alcohol before inserting a device into the vial.

3) Never administer medications from the same syringe to multiple patients, even if the needle is changed.
4) Do not reuse a syringe to enter a medication vial or container.
5) Do not administer medications from single dose or single use vials, ampoules or bags or bottles of IV solution to more than one patient.
6) Do not use fluid infusion or administrations sets for more than one patient.
7) Dedicate multidose vials to a single patient whenever possible.
8) Dispose used sharps at the point of use in a sharps container that is closable, puncture-resistant, and leak-proof.
9) Wear a facemask when placing a catheter or injecting material into the epidural or subdural space.

When examining respiratory hygiene, the CDC was able to create several recommendations for outpatient settings. The two main points were to implement measures to contain patients who have signs and symptoms of a respiratory infection and to educate health professionals on the importance of infection prevention measures to reduce the spread of respiratory pathogens. When determining the appropriate measures to contain patients of interest, ideas included providing tissues, masks, and a separate space to encourage individuals with symptoms of infection to sit as far away from others as possible.[7] In addition, it was recommended to post signs at entrances with

instructions to patients with likely respiratory infections to: inform health professional of symptoms, cover their mouth when coughing, use and dispose of tissue, and perform hand hygiene after hands have been in contact with respiratory secretions.

CHAPTER III: SELF STUDY: OBSERVATIONS OF FIVE PHYSICIANS IN THE OMAHA AND KANSAS CITY AREA

HYPOTHESIS

For HAIs to be prevented, health care providers need to be trained on the correct procedures stated by federal agency guidelines. In light of the current problem with HAIs, I predict that not all health professionals will be able to follow every standard precaution created by the CDC, leading to the possible explanation of increased HAIs in the 2015 CDC progress report in both acute and long-term acute care hospitals.[6]

METHODOLOGY/RESEARCH DESIGN

In order to get a better understanding of how physicians play a huge role in preventing HAIs in clinical settings, I conducted an observational study with five physicians (and accompanying health professionals) in the Omaha and Kansas City area. The physicians I observed had the following specialties:

family medicine (2), pediatric infectious disease, internal medicine, and internal medicine with a specialization in gastroenterology. A total of 56 patient visits were observed during my study. When shadowing each individual, I noted standard infection precautions (created by the CDC) for all patient care settings. The procedures examined included: hand hygiene before and after the patient visit, whether or not health professionals wore personal protective equipment, if hand hygiene was practiced after removal of PPE, whether or not proper injection safety was used, if contaminated material was handled properly, if contaminated material was disposed of properly, and whether or not clinics took the cautionary step to prevent respiratory infections by providing face masks (Table 5). When determining whether or not proper standards and regulations were practiced, I referred to the infection control page of the CDC regarding "Standard Precautions for all Patient Care."

RESULTS AND DATA INTERPRETATION

Observations from my study were compared to the CDC's 2015 national progress reports.[6] Results from the CDC were broken down into three settings: acute care hospitals, long term acute care hospitals, and inpatient rehabilitation facilities. Because I

visited 3 clinics and 2 hospitals, findings excluded comparison to inpatient rehabilitation facilities. When examining the acute care report (Figure 1)[6], I noticed HAI prevention lacked or did not change in 5 out of 7 categories. Of these categories, 5 can be prevented by healthcare providers if standard precautions are used. When reading the results of long term acute care, HAI prevention lacked or did not change in 3 out of 5 categories. Of these categories, 3 can be prevented by healthcare providers.

Results from my study (Figure 2) showed that all physicians I shadowed excelled in handling and properly disposing contaminated material. In regard to hand hygiene, sanitation before visiting a patient occurred 98.21% of the time, sanitation after visiting a patient occurred 89.29% of the time, and sanitation after removal of PPE occurred 57.14% of the time. In regard to proper use of PPE, 85.71% properly used the equipment. Because of the proper use of PPE, 81.82% met injection safety protocol. Out of the three clinics I visited, 66.67% took the cautionary steps necessary to prevent respiratory infections in the waiting room.

Table 5: Results from Observation of Health Professionals

Family Medicine (1) – Outpatient Care	
Hand Hygiene Before Contact	
Observation Day #1	**YES**

	YES
	YES
	YES
	YES
Observation Day #2	YES
	YES
	YES
Observation Day #3	YES
	YES
	NO
	YES
Hand Hygiene After Contact	
Observation Day #1	YES
	YES
	YES
	YES
	YES
Observation Day #2	YES
	NO
	YES
Observation Day #3	YES
	YES
	YES
	NO
Proper PPE	
Observation Day #1	NA
	NA
	YES
	NO
	NA
Observation Day #2	NA
	NA
	YES
Observation Day #3	NA
	NA
	NA
	YES
Hand Hygiene After Removing PPE	
Observation Day #1	NA
	NA
	YES
	YES
	NA
Observation Day #2	NA

	NA
	NO
Observation Day #3	NA
	NA
	NA
	YES
Proper Protocol for Infection Safety	
Observation Day #1	NA
	NA
	YES
	NO
	NA
Observation Day #2	NA
	NA
	NA
Observation Day #3	NA
	NA
	NA
	YES
Proper Handling of Contaminated Material	
Observation Day #1	NA
	NA
	YES
	YES
	NA
Observation Day #2	NA
	NA
	YES
Observation Day #3	NA
	NA
	NA
	YES
Proper Disposal of Contaminated Material	
Observation Day #1	NA
	NA
	YES
	YES
	NA
Observation Day #2	NA
	NA
	YES
Observation Day #3	NA
	NA

	NA
	YES

Internal Medicine – Inpatient Care	
Hand Hygiene Before Contact	
Observation Day #1	YES
	YES
	YES
	YES
	YES
Observation Day #2	YES
	YES
	YES
	YES
	YES
	YES
Hand Hygiene After Contact	
Observation Day #1	YES
	YES
	YES
	YES
	YES
Observation Day #2	YES
	YES
	YES
	YES
	YES
	YES
Proper PPE	
Observation Day #1	NA
	YES
	YES
	NA
	NA
Observation Day #2	NA
	YES
	NA
	NA
	YES
	NA
Hand Hygiene After Removing PPE	
Observation Day #1	NA
	NO
	YES

	NA
	NA
Observation Day #2	NA
	YES
	NA
	NA
	NO
	NA
Proper Protocol for Infection Safety	
Observation Day #1	NA
	NA
	NA
	NA
	NA
Observation Day #2	NA
	NA
	NA
	NA
	NA
	NA
Proper Handling of Contaminated Material	
Observation Day #1	NA
	NA
	NA
	NA
	NA
Observation Day #2	NA
	NA
	NA
	NA
	NA
	NA
Proper Disposal of Contaminated Material	
Observation Day #1	NA
	YES
	YES
	NA
	NA
Observation Day #2	NA
	YES
	NA
	NA
	YES

	NA

Pediatric Infectious Disease – Outpatient Care	
Hand Hygiene Before Contact	
Observation Day #1	YES
	YES
	YES
	YES
Hand Hygiene After Contact	
Observation Day #1	YES
	YES
	YES
	YES
Proper PPE	
Observation Day #1	NA
	YES
	NA
	NA
Hand Hygiene After Removing PPE	
Observation Day #1	NA
	YES
	NA
	NA
Proper Protocol for Infection Safety	
Observation Day #1	NA
	YES
	NA
	NA
Proper Handling of Contaminated Material	
Observation Day #1	NA
	YES
	NA
	NA
Proper Disposal of Contaminated Material	
Observation Day #1	NA
	YES
	NA
	NA

Family Medicine (2) – Outpatient Care

Hand Hygiene Before Contact	
Observation Day #1	**YES**
	YES
	YES
	YES
	YES
Hand Hygiene After Contact	
Observation Day #1	**YES**
	YES
	YES
	NO
	YES
Proper PPE	
Observation Day #1	**NO**
	YES
	NA
	YES
	NA
Hand Hygiene After Removing PPE	
Observation Day #1	**YES**
	YES
	NA
	NO
	NA
Proper Protocol for Infection Safety	
Observation Day #1	**NO**
	NA
	NA
	YES
	NA
Proper Handling of Contaminated Material	
Observation Day #1	**YES**
	NA
	NA
	YES
	NA
Proper Disposal of Contaminated Material	
Observation Day #1	**YES**
	YES
	NA
	YES
	NA

Internal Medicine Gastroenterology – Inpatient Care	
Hand Hygiene Before Contact	
Observation Day #1	YES
	YES
	YES
	YES
	YES
	YES
Observation Day #2	YES
	YES
	YES
	YES
	YES
	YES
	YES
Observation Day #3	YES
	YES
	YES
	YES
	YES
Observation Day #4	YES
	YES
	NO
	YES
	YES
	YES
Hand Hygiene After Contact	
Observation Day #1	YES
	YES
	YES
	YES
	YES
	NO
Observation Day #2	YES
	YES
	YES
	YES
	YES
	YES
	NO
Observation Day #3	YES
	YES
	YES
	YES

	YES
Observation Day #4	YES
	YES
	YES
	YES
	YES
	NO
Proper PPE	
Observation Day #1	NA
	NA
	NA
	NA
	YES
	NA
Observation Day #2	NO
	YES
	NA
	NA
	YES
	NA
	YES
Observation Day #3	NA
	NA
	YES
	YES
	NA
Observation Day #4	NA
	YES
	NA
	NA
	YES
	NA
Hand Hygiene After Removing PPE	
Observation Day #1	NA
	NA
	NA
	NA
	YES
	NA
Observation Day #2	NO
	YES
	NA
	NA
	NO

	NA
	NO
Observation Day #3	NA
	NA
	YES
	NO
	NA
Observation Day #4	NA
	YES
	NA
	NA
	NO
	NA
Proper Protocol for Infection Safety	
Observation Day #1	NA
	NA
	NA
	NA
	YES
	NA
Observation Day #2	NA
	NA
	NA
	NA
	YES
	NA
	NA
Observation Day #3	NA
	NA
	YES
	YES
	NA
Observation Day #4	NA
	YES
	NA
	NA
	NA
	NA
Proper Handling of Contaminated Material	
Observation Day #1	NA
	NA
	NA
	NA
	YES

	NA
Observation Day #2	NA
	YES
	NA
	NA
	YES
	NA
	NA
Observation Day #3	NA
	NA
	YES
	YES
	NA
Observation Day #4	NA
	YES
	NA
	NA
	NA
	NA
Proper Disposal of Contaminated Material	
Observation Day #1	NA
	NA
	NA
	NA
	YES
	NA
Observation Day #2	YES
	YES
	NA
	NA
	YES
	NA
	YES
Observation Day #3	NA
	NA
	YES
	YES
	NA
Observation Day #4	NA
	YES
	NA
	NA
	YES
	NA

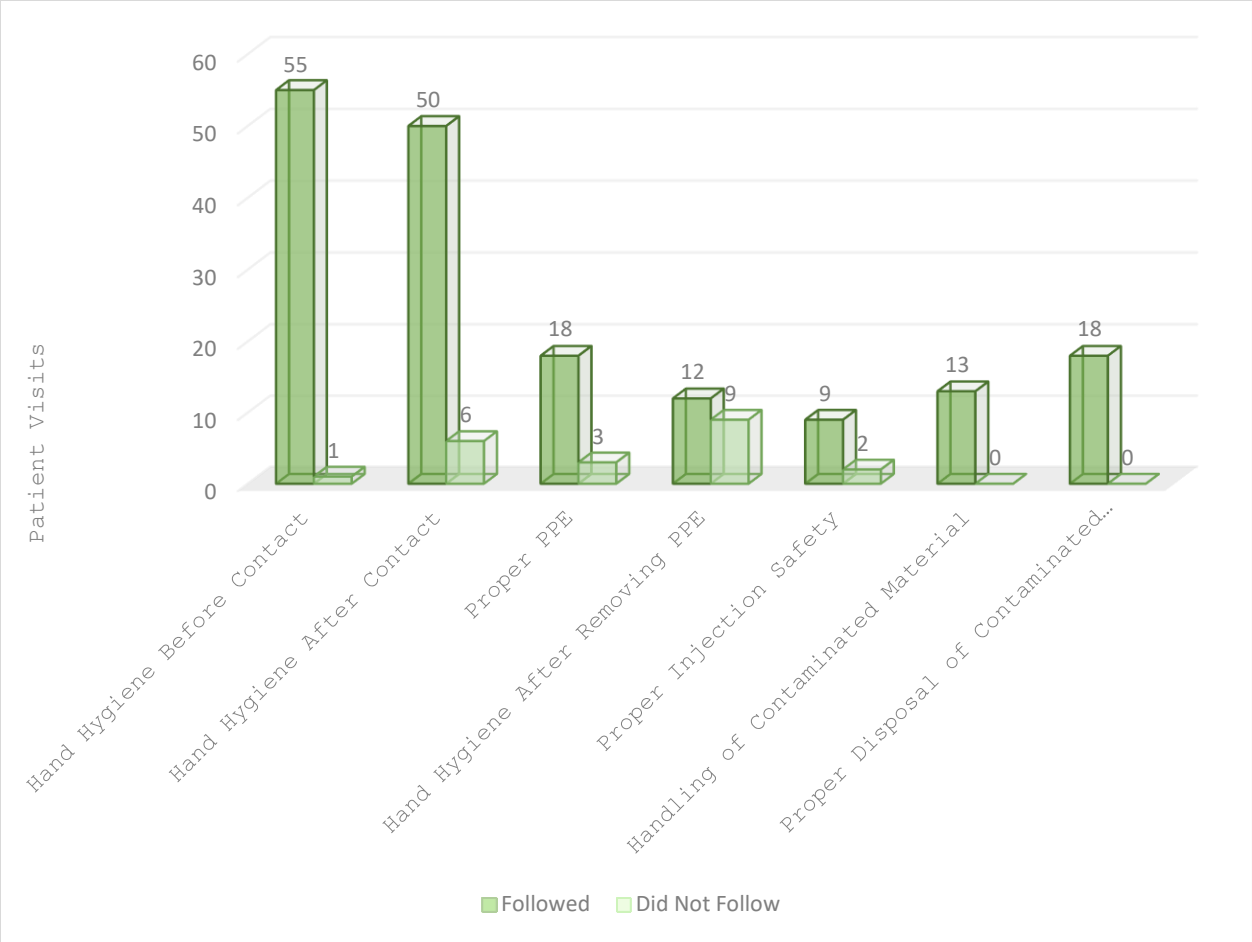

Figure 2: Observations of Five Physicians (and Accompanying Health Professionals) in the Omaha & Kansas City Area

CHAPTER IV: CONCLUSIONS

In my study, I observed the lack of proper techniques particularly for all steps, excluding proper handling and disposal of contaminated material. Due to the small size of my study, data may not be representative of all doctors and health professionals. Aside from sample size, my observations do suggest that these clinicians are not following all the

recommendations for proper health care delivery and further education. Thus, reduction in HAI rate could be achieved by promoting higher compliance with the recommended procedures. Overall, greater understanding needs to be placed on the concern of promoting higher compliance.

Because statistical methods were not used and the sample size in the self-study was inadequate, results must be termed inconclusive. However, a weak trend can be seen in both sets of data. After conducting my study, I can conclude that there is a possible association between a higher standard infection ratio (summary statistic used to track HAI prevention over time) and lack of standard hand hygiene and use of PPE. Although studies towards HAI solutions seems promising, the global concern of these infections will never be resolved if healthcare providers and patients do not take the conscious effort to work together in infection prevention and control.

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