## **Original Research Article**

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# Importance of handwashing prior to wound dressings in prevention of nosocomial infection in surgical wards

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## **ABSTRACT**

**Background:** Nosocomial infections have been recognized for more than a century as a critical problem affecting the quality of health care provided in hospitals. In this study we are assessing the nosocomial infection in surgical wards and creating awareness among resident doctors about the same.

**Methods:** All 3 years surgery residents were taken for the study. Study was done from July 2015 to August 2017. They were given KAP questionnaire before and after the study to assess the basic knowledge about nosocomial infection and handwashing (1 mark for each correct answer). From each resident doctor 3 swab samples will be taken after doing dressing of the same patient having significant wound discharge. The first swab sample will be taken immediately after dressing without doing any type of handwashing. The second swab sample will be taken after doing dressing of the same patient and after handwashing with soap and water. The third swab sample will be taken after doing dressing of the same patient and handwashing with sterilium. All these reports were compared with patient's wound swab to assess the role of doctor's hand in spreading nosocomial infection. At the end of study proper knowledge hand hygiene and hand washing was spread.

**Results:** We observed that out of 58 surgery residents total of 47 residents were having positive microbiological swabs without any type of handwashing; 24 residents were having positive swabs even after washing hands with soap and water; 3 residents were having positive swab after washing hands with sterilium. Which suggests that resident doctors were not maintaining hand hygiene. In our KAP based assessment only 31% resident doctors could give >50% correct answers before the study and 96% resident doctors could give >50% correct answers after the study.

**Conclusion:** At the end of the study ideal method of handwashing was taught. We have also assessed basic knowledge of resident doctors regarding hand hygiene and nosocomial infection. We have spread the knowledge and awareness of appropriate type of handwashing among resident doctors.

**Keywords:** Handwashing, Nosocomial Infection, Surgical ward infections, Surgical site infection, Wound dressing precautions

## INTRODUCTION

Nosocomial infections have been recognized for more than a century as a critical problem affecting the quality of health care provided in hospitals. Worldwide, sepsis is the cause of death in about 1400 people each day. Many of these people develop sepsis from infections acquired as patients while in a hospital. Infections acquired in the hospital are called nosocomial infections. They are the most common complications of hospitalized patients,

with 5-10% of patients in acute care hospitals acquiring at least one infection. Results of previous study show that atleast 1/3 of all nosocomial infections are preventable. Ignaz Semmelweis first introduced hand washing for medical students and physicians and he played important role in prevention of nosocomial infection. Thus, he is known as "father of infection control".

A significant proportion of infections result from cross contamination, and transmission of micro-organisms by the hands of health care workers is the main route of spread. Two major groups of micro-organisms may be found on the skin: organism that reside on it (resident flora) and contaminants (transient flora). Unless introduced into body tissues by trauma or by medical devices such as intravenous catheters, the pathogenic potential of resident flora is usually regarded as low. In contrast, transient flora causes most nosocomial infections resulting from cross transmission. Prevention of bacterial contamination by transient flora and possible subsequent infection requires timely hand cleansing that may be achieved by washing or disinfecting hands. Although recent guidelines delineate indications for hand cleansing, they do not rely on evidence of microbiologic contamination acquired during routine patient care. To provide such evidence, we need to study the dynamics of bacterial contamination of hands of healthcare workers in daily hospital practice. Study findings should help identify patient care situations associated with high contamination levels and ultimately improve hand cleansing practices.2

Improvement of hand hygiene, with the aim of minimizing nosocomial infection, is a high priority of the World Health Organization (WHO). The promotion of effective measures to improve hand hygiene is therefore one of the five foremost goals of the WHO's current worldwide patient safety initiative (announce action on patient safety [high 5s] initiative, Washington, DC, 4 November 2006). By September 2008, 114 countries had given written undertakings to implement these goals.<sup>3</sup>

Aims and objectives of this study were to compare efficacy of hand washing with soap and water and hand washing with disinfectant in prevention of nosocomial infection in surgical wards and to spread knowledge and awareness regarding appropriate type of handwashing.

## **METHODS**

A study group of all 3 years Post Graduate General Surgery resident doctors (Sample Size: 58) of Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune were selected. They were given KAP (Knowledge Attitude and Practice) questionnaire before the study to assess their basic knowledge about wound dressings and nosocomial infections. 1 mark was given for each right answer. First swab will be taken from the wound of the patient whose dressing the resident doctor is supposed to do. From each resident doctor 3 swab

samples will be taken. Each swabs sample will be taken after doing dressing of the same patient having significant wound discharge. The first swab sample will be taken immediately after dressing without doing any type of handwashing. The second swab sample will be taken after doing dressing of the same patient and after handwashing with soap (lifebuoy) and water (for 60 seconds). The third swab sample will be taken after doing dressing of the same patient and handwashing with sterilium (alcohol-based hand rub) for 60 seconds.

In the present study we had asked resident doctors to do dressings without wearing gloves so accurate results of hand transmitted nosocomial infection could be found and need for appropriate method of handwashing can be proved.

## Method of taking swab

A sterile cotton swab moistened with sterile normal saline will be rubbed over the entire ventral surfaces of the thumb and the fingers as well as between the fingers of the resident doctors. Swab will be immediately sent for microbiological evaluation. The samples will be tested for the identification of the bacterial colonization using various microbiological methods. The organism present on the swabs will be grown on agars like blood agar, Mckonkey agar, nutrient agar etc. The culture reports of wound swab of the patient will be compared with the culture report of hand swabs taken prior to hand washing and after handwashing. This will prove which type of hand washing is efficacious.

In case of wound infection following will be noted:

- Occurrence of the wound infection
- Type of the wound infection whether it is superficial or deep
- Organisms responsible for the wound infection.

## KAP Questionnaire

- Define nosocomial Infection?
- Incidence of Nosocomial Infection?
- Types of Nosocomial Infection?
- Most common organism responsible for Nosocomial Infection?
- Methods to prevent Nosocomial Infection.
- Do you wash hands before dressings?
- If yes then,
  - a. Hand washing with soap water or disinfectant?
  - b. Any other method
- What according to you is the ideal method of handwashing?
- Which one is better method- hand washing or hand disinfectant?
- Do you wash your hands after dressings? Do you think it is important to wash?

After the study is completed again KAP questionnaire will be shared to check the awareness and efficacy regarding the hand washing and nosocomial infection. 1 mark each will be given for each correct answer and score will be compared with the questionnaire taken prior to the study.

Questionnaire was prepared according to WHO guidelines of handwashing.

Proper statistical analysis was done at the end of the study. On the basis of analysis, conclusion will be drawn as to the appropriate way of handwashing in the prevention and control of nosocomial infection.

Awareness among residents about Hand washing technique and nosocomial infection will be done through distributing the pamphlets of handwashing and teaching the ideal method of handwashing.

### **RESULTS**

Out of 58 surgery residents total of 47 residents were having positive microbiological swabs without any type of handwashing. Total of 24 residents were having positive microbiological swabs on their hand even after washing hands with soap and water. And 3 residents were having positive microbiological swab even after washing hands with sterilium (alcohol hand rub).

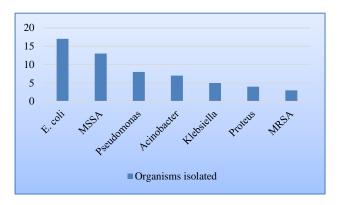


Figure 1: Organisms isolated from the study.

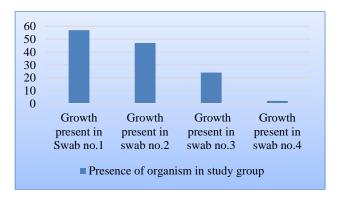


Figure 2: Presence of organism in study group swab no. 1.

Figure 1 shows the microbiological swab results. Following organisms were found from swab no.1 which was taken from patient's wound.

Out of 58 surgery residents total of 47 residents were having positive microbiological swabs without any type of handwashing. Total of 24 residents were having positive microbiological swabs on their hand even after washing hands with soap and water. And 3 residents were having positive microbiological swab even after washing hands with sterilium (alcohol hand rub). Total of 57 patient's wound swab were showing microorganism in swab no. 1. Figure 3 shows 47 resident doctors (81%) were having positive microbiological swab after dressing without handwashing.

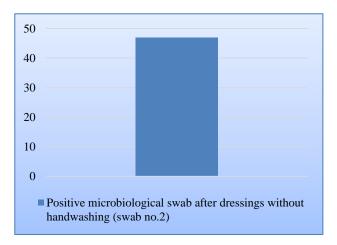


Figure 3: Positive microbiological organism in swab no. 2.

24 resident doctors (41%) were having positive microbiological swab after dressing and handwashing with soap and water (Figure 4).

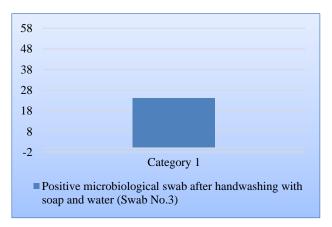


Figure 4: Positive microbiological organism in swab no. 3.

Only 3 resident doctors (5%) were having positive microbiological swab after dressing and handwashing with alcohol-based rub (Figure 5).

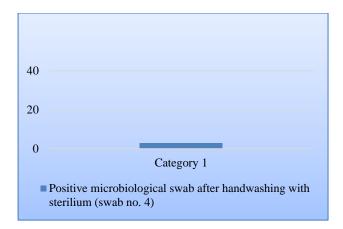


Figure 5: Positive microbiological organism in swab No. 4.

In the present study we also noted that the organisms like pseudomonas and MRSA are not killed by even alcoholbased rub (sterilium) (Figure 6).

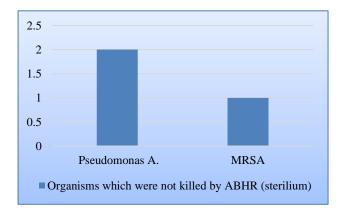


Figure 6: Organisms which were not killed by ABHR.

In the present study group before the starting of the study and at the end of the study questionnaire was given to each and every resident doctors. The basic knowledge of resident doctors about hand washing, hand hygiene and nosocomial infection was measured on the scale of 10. The results are as followed.

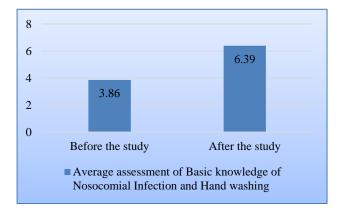


Figure 7: Average assessment score of Resident doctors

In our assessment, the average score of basic knowledge of nosocomial infection and hand washing before the present study was 3.86 and the average assessment score after the present study was 6.39. Below are the results (Figure 7).

In prestudy assessment only 18 students could answer more than 50% that is >5 out of 10 questions and in the assessment, which was done after the study 56 students could answer more than 50% of the questions. Here "able to answer 50% of the questions correctly" was taken as a measure of satisfactory knowledge about hand hygiene practices and nosocomial infection (Figure 8).

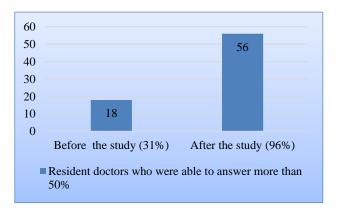


Figure 8: Post study score assessment comparison.

Total of 31% resident doctors could give >50% correct answers before the study and 96% resident doctors could give >50% correct answers after the study.

All the resident doctors were taught ideal method of dressing, hand washing, and proper knowledge of nosocomial infections was given during our study and significant improvement was noted in our study group. At the end of the study more than 96% resident doctors were able to correctly answer >50% of the questions.

Also, statistical analysis was done of both the study groups and P value was found to be <0.05 which shows significant difference between the study groups.

## **DISCUSSION**

A large proportion of the infection acquired in the surgical wards have been attributed to cross contamination and transmission of microbes from hand of health care workers to patients. Many studies have consistently shown that improved hand hygiene practice reduced nosocomial infections and cross transmission of multidrug resistant infections in hospital. Despite this, present day data suggest that hand hygiene compliance among health care personnel in most hospital is at best, less than 50%. Working in ICUs, doctors under staffing, overcrowding, high intensity patient care insufficient time, lack of institutional priority etc were some of the risk factors for poor hand hygiene compliance. Many

attempts have been made in the past to improve hand hygiene compliance such as educational intervention, motivational programmes etc. However, most of these met with little or temporary success. Hence several multifaceted interventions, which include behavioural, environmental and social changes, have been suggested and tried to sustain improvement in hand hygiene compliance.<sup>4</sup>

In the present study total of 58 general surgery resident doctors were chosen and efficacy of handwashing with soap-water and alcohol-based rub was checked in surgical wards. Also, basic knowledge of nosocomial infections and hand hygiene practices was checked and awareness regarding appropriate way of handwashing was spread among all.

During the ward dressings we observed that out of 58 surgery residents total of 47 residents were having positive microbiological swabs without any type of handwashing. Total of 24 residents were having positive microbiological swabs on their hand even after washing hands with soap and water. And 3 residents were having positive microbiological swab even after washing hands with alcohol hand rub. This suggests that whenever a doctor is not washing his/her hand after dressing there are chances of spreading the organism to another patient are 81%. This probability of transmitting organism reduces to 41% when he/she has washed hands with soap and water. And after rubbing hands with sterilium it has significantly come down to 5%.

Goel et al also presented a cross sectional study total of Eighty-six doctors of all designations. The swabs were taken at entry in the wards and also at exit from the wards without washing the hands. Then, swabs were taken after hand washing with tap water and subsequently after alcohol swabs. Staphylococcus aureus was isolated in 24.41% at entry and in 52.33% at exit. Similarly, Pseudomonas aeruginosa and Klebsiella pneumonia were not present on the hands of doctors at entry but isolated in 5.81% and 10.46% of doctors at exit. Complete removal/reduction of microorganism (100%) was recorded in Escherichia coli and Candida sp after tap water wash. Decrease in count of Pseudomonas aeruginosa up to 80.00% after tap water wash. 88.89% decrease in microorganism after subsequent alcohol wash was seen in Staphylococcus aureus, Coagulase-negative Staphylococci and Klebsiella pneumonia. They concluded that simple hand washing (first with water and then with alcohol) is an effective tool to reduce the contamination significantly.<sup>5</sup> In the present study also we have proved that use of alcohol-based hand rub has maximum effect on organism like E. coli, Klebsiella, Acinobacter, Pseudomonas Ag etc. Thus, we have made the resident doctors aware in preventing the spread of nosocomial infection.

At the end of the study ideal method of handwashing was proved. Which is hand washing with soap-water followed by rubbing of hand with sterilium for 60 seconds. In the present study we also did assessment of basic knowledge about handwashing and nosocomial infection. In our assessment, the average score of basic knowledge of nosocomial infection and hand washing before the present study was 3.86 and the average assessment score after the present study was 6.39. Total of 31% resident doctors could give >50% correct answers before the study and 96% resident doctors could give >50% correct answers after the study. Also, statistical analysis was done of both the study groups and P value was found to be <0.05 which shows significant difference between the study groups. Which suggests that after the study resident doctors could answer questions. Thus, significant improvement in hand hygiene knowledge and basic knowledge about nosocomial infection was noted.

Bergellini et al conducted similar study to measure hand contamination of medical students attending surgical wards. They found that hand hygiene practices and knowledge were significantly higher in nursing compared to medical students. The most effective procedure in reducing bacterial contamination was the alternate use of hand washing and hand rubbing compared to only one practice and the absence of hand hygiene. Hand contamination was significantly higher in students who declared to have hardly ever/never implemented Hand Hygiene teaching during clinical practice compared to those who stated to have done it frequently/always.<sup>6</sup> In our study through the questionnaire we have educated the resident doctors about hand hygiene practices so that can reduce nosocomial infection.

In the present study the pamphlets regarding ideal method and steps of handwashing was distributed among the resident doctors during the study. And appropriate method of handwashing was taught. We have also displayed posters in each and every general surgery ward's dressing room area so that can draw attention of resident doctor while dressing.

Davis CR also conducted a study on to eradicate MRSA from surgical wards. Compliance was assessed via a discretely positioned close-surveillance camera at the ward entrance. Footage was reviewed to monitor compliance of all persons entering the ward over a 12month period. For the initial 6 months, mean alcohol gel compliance was 24% for all persons entering the ward. After this period, a conspicuous strip of bright red tape was positioned along the corridor approaching the ward entrance. The red line continued up the wall to an arrow head pointing to the two alcohol gel dispensers on the wall. Mean compliance over the subsequent 6 months significantly improved to 62% (P < 0.0001). There were two cases of MRSA bacteraemia in the initial 6 months and no cases in the following 6 months with the red line in situ.<sup>7</sup> In the present study also we have distributed pamphlets and displayed posture of ideal method of handwashing (guided by WHO) in each dressing room of each surgical ward

The pamphlet showing ideal method of handwashing. (WHO guided). The pamphlet showing ideal method of Hand rubbing with Sterilium. (WHO guided).<sup>8</sup>

We also found some basic precautions which needs to be taken by resident doctors which are as followed:<sup>9,10.</sup>

- Cutting their nails regularly
- Applying Mupirocine ointment on nasal mucosa in individuals who are having positive nasal swabs for MRSA
- Washing hands before and after going to washroom
- Washing hands before and after eating food
- Use of sterile instruments and dressing drums
- Prefer having assistant during dressings
- Before putting on gloves
- After contact with body fluids.
- After handling soiled linen and objects.
- After removing gloves
- Before patient contact
- After patient contact
- Before patient equipment contact
- After patient equipment contact
- Gloves used whenever potential for hand contact with body fluids
- Gloves removed after use.

Thus, in the present study we have concluded ideal method of hand washing which is to use soap and water followed by sterilium and we have also assessed basic knowledge of resident doctors regarding hand hygiene and nosocomial infection and we have spread the knowledge and awareness of appropriate type of handwashing.

## CONCLUSION

In the present study we have compared the efficacy of handwashing with soap and water and handwashing with disinfectant in prevention of nosocomial infection in surgical wards. We have concluded ideal method of hand washing which is to use soap and water followed by alcohol-based rub (sterilium).

We have also assessed basic knowledge of resident doctors regarding hand hygiene and nosocomial infection. We have spread the knowledge and awareness of appropriate type of handwashing among resident doctors.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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