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BACTERIAL CONTAMINATION OF ANAESTHETISTS HANDS, PERSONAL MOBILE PHONES AND WRIST WATCHES USED DURING THEATRE SESSIONS

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Background:

Personal items such as mobile phones and wrist watches are commonly used by doctors working in the operation theatre. The hands and personal use items of anaesthetic doctors working in the operation theatre may serve as vectors for transmission of nosocomial pathogens among surgical patients. Our aim was to determine the hand contamination among anaesthetists working in the operation theatre and contamination of mobile phones and wrist watches of anaesthetic doctors.

Method :

Forty five anaesthetic doctors working in the operation theatres at Colombo South Teaching Hospital and Ratnapura General Hospital were enrolled in the study. Swabs from fingertips, keypads of mobile phones and wrist watches were taken using moist sterile swabs and plated on Mac Conkey and Blood agar plates. The bacteria isolated were identified by biochemical tests.

Results:

Hand washing was performed by 60% (n=27/45) doctors entering the theatre. 95% (n=43/45) brought their mobile phone to the theatre and 78.5% used it at least once during the theatre session. A wrist watch was worn by 71% (n=32/45) of the anaesthetic doctors working in the theatre. Bacterial growth was detected from 84% wrist watch swabs, 71% fingertip swabs and 70% mobile phone swabs. Staphylococci were predominantly cultured from all three specimens tested. MRSA was isolated from 22% of swabs taken from fingertips, 15% mobile phones and 25% wrist watches respectively. Methicillin sensitive *Staphylococcus aureus* (MSSA) was isolated from 33%, 46.5% and 37.5% swabs from fingertips, mobile phones and wrist watches respectively. Coagulase negative Staphylococci was isolated from wrist watches (15%) and fingertip specimens (2%). 29% fingertip swabs and 30% mobile phone swabs did not show bacterial growth.

Conclusion:

Personal use items of doctors such as mobile phones and wrist watches show a high percentage of bacterial contamination. Hand washing compliance was moderate among the study population. Thus personal use items and hands may act as an important source of nosocomial pathogens in the Sri Lankan operation theatre settings. Therefore it is important to encourage higher compliance to hand washing practices and routine surface disinfection of personal use items brought to the operation theatre.

Nosocomial infections are a serious problem in hospitals causing increased morbidity and mortality among hospitalised patients. It significantly increases the patients' length of stay in hospital resulting in higher hospital costs. Approximately 2 million nosocomial infections occur in the USA.¹ The most common nosocomial infections include urinary tract infections, surgical site infections (SSIs), skin and soft tissue infections and respiratory tract infections.² According to the Centers for Disease Control and Prevention (CDC), SSIs account for 14 to 16% of all nosocomial infections and account for 38% of nosocomial infections among surgical patients. Source of infection may be exogenous such as from the air, medical equipment, hands of surgeons and other staff or endogenous such as the skin flora in the operative site, or rarely from blood used in the surgery.² CDC guidelines recommend several preoperative preparation practices important in preventing nosocomial infections in surgical patients which include hand scrubbing procedures of the surgical team.³

Use of personal items such as mobile phones and wrist watches are commonplace in the Sri Lankan operation theatres, and could play an important role as a source of hand contamination. Personal use items mentioned above are indispensable in normal daily life. In the health care setting the mobile phone gives quick and easy access to the health care personnel enabling them to be contacted promptly when required specially during an emergency. Currently in Sri Lanka there are no cleaning guidelines for personal use items of health care workers or regulations restricting medical staff to carry these items into the sterile environment of the operation theatre. The possibility that these items can act as a vehicle for transmission of pathogens is high if they are used during patient contact or prior to invasive procedures. In a recent study, Jeske et al (2007) showed that mobile or fixed phone use by anaesthetists working in the operation theatre demonstrated a 10% rate of contamination with human pathogenic bacteria and a high contamination rate with non-human pathogenic bacteria.⁴

As anaesthetists perform various invasive procedures during surgery it is important to maintain sterility of the hands. In Sri Lankan operating theatre settings, before entering the operating theatres anaesthetists change into sterilised theatre suits but do not perform routine hand washing or decontamination. However the practice of hand washing and decontamination is strictly followed when performing invasive procedures. Therefore it is possible that the use of personal items in the theatre will contribute to contamination of anaesthetists' hands and be a source of transmission of pathogenic organisms from the hospital wards and the community in to the operation theatres. The purpose of this study was to evaluate the amount of contamination of the hand, watches and mobile phones in anaesthetists working in the operation theatre.

Materials and Methods

Fourty five anaesthetists working in the operation theatres at Colombo South Teaching Hospital and Ratnapura General Hospital were enrolled in the study. The specimens were collected on one working day to avoid repetition from all volunteers attending the operation theatre. The procedure of specimen collection was explained to the volunteers and a questionnaire was filled after obtaining informed consent. Ethical clearance for the study was obtained from the Ethical review committees of Colombo South Teaching Hospital and Faculty of Medical Sciences, University of Sri Jayawardenepura.

Specimen collection and microbiological analysis

Swabs were collected from fingertips of the dominant hand, keypads of mobile phones and wrist watches using moist sterile cotton swabs. The swabs were transported to the laboratory and inoculated on Blood Agar and MacConkey Agar plates.

The plates were incubated at 37°C for upto 48 hours. Colonies were counted and the organisms were identified up to species level by using Gram's staining, colony morphology and appropriate biochemical tests.

For identification of Gram positive cocci (GPC); *Staphylococcus aureus* was identified by the

catalase and coagulase tests. They were further checked for sensitivity to methicillin to differentiate between Methicillin Resistant *Staphylococcus aureus* (MRSA) and Methicillin Sensitive *Staphylococcus aureus* (MSSA). Nonhaemolytic, catalase-positive, coagulase negative GPC were identified as *Micrococcus* species while the other catalase-positive, coagulase-negative Gram positive cocci were grouped as coagulase-negative *Staphylococci* (CNS). The Oxidase and catalase test was carried out for the Gram negative bacilli. Further identification was done using API (Bio murex)

Results

Practice of hand washing and use of personal items in the Operation theatre (OT).

Hand swabs of thirty anaesthetists from the Colombo South teaching hospital and 15 anaesthetists from the Ratnapura General hospital were collected for the study. Questioning the doctors on their hand washing practices revealed that 60% of the anaesthetic doctors (n= 27) had washed their hands on entering the OT using soap (78%) or Betadine (22%). Majority of doctors working in the OT used personal mobile phones and wrist watches. In our study 95% (n= 43/45) had brought their mobile phones to the OT and among them 78% (n=33/42) used their mobile phone at least once during the theatre session. A wrist watch was worn by 71% (n=32/45). Hand washing compliance among the anaesthetists was moderate, whereas use of personal mobile phones and wrist watches in the OT was high.

Hand contamination of doctors

Finger swabs from 32 doctors (71%) showed bacterial growth. No growth could be detected in swabs from 13 doctors. 93% (n=30/32) had single type of colonies while 2 samples gave a mixed growth of two organisms. Majority of the isolates (n=25/45) were *Staphylococcus aureus* (55%), which can act as nosocomial pathogens. Hands of ten doctors were contaminated with MRSA (22%, n=10/45). The result of microbiological identification of contaminating organisms from finger tips, mobile phones and wrist watches are listed in Table 1.

Table 1.
Microbiological analysis of swabs taken from finger tips, mobile phones and wrist watches.

Isolated organisms	Number of isolates obtained from culture of swabs		
	Finger tips	Mobile phones	Wrist watches
MRSA	10	6	8
MSSA	15	20	12
CNS	1		5
Micrococci	4		
Enterococci	2		
Enterobacter clocae	1	1	
Klebsiella pneumoniae	1		
Acinetobacter baumanii		1	
Weeksella virosa			1
Brevindomonas diminuta			1

From the doctors who had washed hands with soap or betadine, 44% (n=12/27) did not grow any bacterial colonies from finger tips. 40% (n=11/27) gave a low colony count less than 10 CFU from finger tip swabs while the remaining specimens yielded 10-100 CFU in the hand washed group. As expected the colony count from finger tips of doctors who did not perform hand washing on entering the operation theatre showed high percentage (94% n=17/18) of bacterial contamination of the finger tip swabs.

Contamination of Mobile phones and wrist watches

Forty mobile phone swabs and 32 wrist watch swabs were taken for microbiological analysis. Highest contamination was observed from wrist watch swabs 84% (n=27/32) while 70% (n=28/40) mobile phones were contaminated. Similar to the results of hand contamination, *Staphylococci* were predominantly isolated from mobile phones (65%, n=26/40) and wrist watches (78%,n=25/32). MRSA was isolated from 15% (n=6) and 25% (n=8) mobile phones and wrist watches respectively. One Mobile phone swab yielded *Enterobacter clocae* and a heavy growth of *Acinetobacter baumanii*. Wrist watch surface swabs from one subject yielded a mixed growth of MRSA, *Weeksella virosa* and *Brevundimonas diminuta*. These results indicate

that the mobile phones and wrist watches are an important source of human pathogenic organisms and can serve as vectors for cross-transmission to hands of the doctors and subsequently to patients.

Discussion

In this study we assessed the contamination of anaesthetists hands and personal items used with human pathogenic microorganisms which may act as nosocomial pathogens in the operation theatre setting.

Hands have been implicated as one of the most important transmission source of nosocomial pathogens in the health care setting. Increased clinical activity has been shown to result in increase of total bacterial counts on the hands of medical staff.⁵ Therefore maintaining good hand hygiene is important prior to patient handling. Further hand hygiene is considered to be a most simple, inexpensive and effective tool in reducing nosocomial infections. However studies on hand washing compliance, reveal a relatively low or moderate compliance rate (16% to 81%) among doctors and nurses in many countries.^{6,7,8} In our study the doctors compliance in hand washing was 60% among anaesthetists.

Simple hand washing has been shown to be effective in reducing the transmission of pathogenic bacteria and viruses among health care workers especially during outbreaks.¹ Many hand washing and scrubbing agents have been evaluated for their efficiency of hand disinfection. Alcohol based hand rubs consisting of ethanol, isopropanol or n-propanol has been shown to achieve between 3 to 6 mean log reduction of hand flora as compared to relatively lower effect by plain soap, chlorhexidine or triclosan hand washing agents. A cost effective, efficient hand disinfection agent and increased compliance of hand hygiene through awareness programs are important considerations in prevention of nosocomial infection in hospitals. In our study hand washing was performed using non-medicated soap or Betadine hand wash which was available in the theatre.

Our study shows that majority of the doctors used personal items such as mobile phones and wrist watches during the theatre sessions. Studies investigating personal items such as mobile phones, wrist watches, stethoscopes, pens and ties of doctors have been shown to harbour nosocomial pathogens.^{4,8,9} As these items are constantly used in and out of hospital, they can act as transmission vehicles of pathogenic organisms. Due to low awareness among the medical staff these items are infrequently disinfected and extensively used in the hospitals. Currently there are no restrictions for bringing and using these items within the sterile environment of the operation theatre. Further there is a lack of guidelines and recommendations regarding the use of personal items within the hospital and routine surface disinfection practices. Goldblatt et al (2007) carried out a study of bacterial contamination of mobile phones in 3 hospitals in Israel and one hospital in New York. In their study they revealed that 20% of the mobile phones tested harboured pathogenic microorganisms. *Acinetobacter wolffii* was the most common pathogen (53.6%) followed by MRSA 10.3% and *Pseudomonas* species (8%). In their study they showed that almost 50% of the physicians and nurses used their mobile phones during the operation theatre shift.⁸ Our study revealed that 70% of the mobile phones brought to the operation theatre were contaminated with human pathogenic bacteria namely *Staphylococcus aureus* including MRSA which accounted for 15% of mobile phone contaminating organisms.

In another study which studied hand contamination of wrist watch wearers showed that while bacterial contamination of the wrist was increased among wrist watch wearers hand contamination significantly increased following manipulation of the watch.¹⁰ We studied the bacterial contamination of 32 wrist watch swabs. The predominant contaminating bacteria were *Staphylococcus aureus*, similar to mobile phone contaminants. The highest percentage of MRSA (25%, n=8) was found in wrist watches.

Nosocomial pathogens including bacteria, viruses and fungi can survive on inanimate surfaces for long periods of time. Nosocomial

bacteria isolated in our study such as *Staphylococcus*, *Enterococcus*, *Acinetobacter* and *Klebsiella* has been shown to survive on inanimate surfaces for months.¹¹ We did not study the contamination of other groups of pathogens such as viruses and fungi. However some viruses and the nosocomial pathogenic fungi *Candida* can survive for a few months on inanimate objects and thus be transmitted to susceptible patients.¹¹ Therefore the personal items used by doctors such as mobile phones, wrist watches and pens can be a continuous source of transmission in the absence of regular surface disinfection practices.

Conclusion

This study emphasises the importance of increased hand hygiene compliance and surface disinfection of personal items used by doctors. Mobile Phones and wrist watches are frequently contaminated with nosocomial pathogens which include MRSA. Regular surface disinfection of these items can contribute to reduction of transmission of nosocomial pathogens in the health care setting.

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