

Mobile phones and nosocomial infections

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Abstract

The use of mobile phones inside hospitals especially in clinically sensitive areas is a subject of controversy because it may improve the quality of healthcare but also can transmit health care associated infections. To determine the potential role of mobile phones in harboring microorganisms and to evaluate their role in transmission of microorganisms from the mobile phone to the hand of health care personnel, 32 staff members (12, 8 and 12 were neurosurgeons, anesthetists and nurses respectively) were enrolled in this study. A questionnaire was submitted to all participants to collect information on the extent of usage of mobile phones, the location of use, the use of headsets, the awareness of disinfection practices of mobile phones and the frequency of hand washing after using their phones. They were asked to disinfect their hands using an alcohol based hand rub and fingers of both hands were cultured. Then, they were asked to do a short phone call from their personal mobile phones. Sampling was repeated from the hand used to make the call and from each participant's mobile phone. Following the hand rub, no growth was detected. After the use of a mobile phones, the rate of bacterial contamination on the hands increased to 30 / 32 (93.7%) same as that found from the mobile phones (93.7%). The use of mobile phones in clinically sensitive areas should be weighed against the risk for contamination and transmission of infections.

Key words

HEALTH PERSONNEL; CROSS INFECTION – etiology; CELLULAR PHONE;
DISEASE TRANSMISSION – infections

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Introduction

Healthcare associated infections (HAI) increased day by day causing significant rate of morbidity and mortality. These infections may spread through the hands of healthcare workers (HCW), thermometers, stethoscopes, and even toys in the paediatric intensive care units of hospitals as inanimate objects can be contaminated with different pathogens.¹ HCW use mobile phones in hospital halls, laboratories, intensive care units and operating rooms.² During every phone call the mobile phone come into close contact with strongly contaminated human body areas with hands to hands, and hands to other areas like mouth, nose and ears.³ As mobile phones act as perfect habitat for microbes to breed, especially in high temperature and humid conditions,⁴ HCWs' mobile phones may serve as reservoirs of microorganisms that could be easily transmitted from the mobile phones to the HCWs' hands and therefore facilitate the transmission of bacterial isolates from one patient to another in different hospital wards.³

The wide spread use of mobile phones among medical personnel in hospitals is a matter of controversy. The question of concern is how to use the mobile phones sensibly, getting their benefits and minimizing their risks. In an emergency, surgeons can seek urgent help from their superiors and colleagues, call for an opinion from the biomedical or electrical staff in case of any mechanical or instrument failure in the middle of the surgery.⁵ Another point of view argues that, if mobile phones are used carelessly in surgical words or intensive care units (ICU), they may act as a source of infection to patients while handling them, such as during dressing of surgical wounds.⁶ Besides, there are no guidelines for disinfection of mobile phones that meet hospital standards. Moreover, the mobile phones are used routinely all day long and the same phones are used both inside and outside the hospital playing a possible role in spreading infections to the outside community.²

This study was conducted to determine the potential of mobile phones to harbour microorganisms in hospital environments and to evaluate its role in their transmission from the mobile phone to HCWs' hands.

Methods

This study enrolled a total of 32 staff members; they were working in 2 operative rooms (OR) for 2 shifts. There were 12 neurosurgeons, 8 anaesthetists and 12 nurses. A questionnaire was submitted to all participants in the study to collect information on the extent of usage of mobile phones, the location of use, the use of headsets, the awareness of disinfection practices of mobile phones and the frequency of hand washing after using their phones.⁷

After the staff members had finished their shifts, all participants were asked to disinfect their hands using an alcohol based hand rub. Cultures were obtained from the fingers of both hands by covering blood agar plates with five fingertips to show properly disinfected hands. Then they were asked to do a short phone call on their personal mobile phones and sampling was repeated using the fingers of the hand used to make the phone call. Each participant's mobile phone was swabbed aseptically by rotating damp cotton swabs with sterile demineralised water over three sites where hands came into contact with the phone (both sides and keys of mobile phones). Cultures were done on 5% sheep blood agar and MacConkey's agar plates (Oxoid, UK) and then were incubated at 37°C for 48 hours. All plates were examined for visible growth. Based on colonial morphology, Gram stain, pigmentation and different biochemical reactions, isolates were allocated to appropriate genera.⁸ Further identification to species level was carried out on all isolates using analytical profile indices (API). By using Clinical Laboratory Standards Institute guidelines⁹ (CLSI, Atlanta, USA) antibiotic disc susceptibility testing was done to compare isolates recovered from both mobile phones and HCWs' hands.¹⁰ All *Staphylococcus aureus* isolates were tested for meticillin resistance using a disc of meticillin (30 µg) and all Gram-negative bacilli were tested for being multidrug resistant (MDR).

Data was analyzed using SSPS 16. Variables were presented as number and percentages.

Results

Following the use of the alcohol-based hand rub, culture sampling revealed no growth from all HCWs'

hands. After the use of a mobile phone, the rate of bacterial contamination of HCWs' hands increased to 30/32 (93.7%). One bacterial species was isolated from 27/30 (90%) of HCW's hands, 3/30 (10%) grew 2 different bacterial species (*Klebsiella pneumoniae* and coagulase negative *Staphylococcus*) while no bacterial growth was detected in 2/32 (6.2%) of HCWs' hands (Table I). The rate of mobile phone contamination was again 30/32 (93.7%). One bacterial species was isolated from 28/30 (93.3%) of mobile phones, 2/30 (6.6%) grew 2 different bacterial species (*S. aureus* and *Bacillus anthracoid*) while no bacterial growth was detected in 2/32 (6.2%) of mobile phones (Table I). Microbiological analysis revealed that, same microorganisms were recovered from both mobile phones and HCWs' hands that were carrying the phone with the same antibiograms and same biochemical profiles. Two isolates of *S. aureus* 2/14 (14.3%) were meticillin resistant whereas 10/26 (38.5%) of Gram-negative bacilli were MDR.

All HCWs who were participating in the study carried their mobile phones to different wards, operating theatres, recovery rooms, ICU inside the hospital and elsewhere outside the hospital. They would answer and make phone calls on their mobiles while attending patients. None of them used headsets or ever cleaned his mobile or washed his hands after using the mobile phone.

Discussion

The mobile phone use is highly prevalent among medical staff playing a significant role in day-to-day life and contributes positively to their ability to communicate concerning hospital affairs.⁷ However; this referred only to technical aspects and gives no consideration of their possible role in transmission of infections.¹¹

Whereas strict attention is paid to changing clothes, removing jewellery, covering hair, undertaking hand hygiene measures, storing personal objects in changing rooms to reduce the transfer of microorganisms from the external clinical environment into the operating environment, most expensive mobile phones often accompany staff into the operating environment as currently no local policy restricting the use of mobile phones in clinically sensitive areas is in place.¹⁰ This

lack of attention may be referred to little awareness about potential risks posed by mobile phones microbial contamination and their role as vehicle for transmission of infections.⁷

In concordance with our results, Brady *et al.* showed that 89.7% of mobile phones were contaminated by bacteria.¹⁰ Ulger *et al.* stated that 94.5% of phones showed evidence of bacterial contamination and the isolated microorganisms were similar to hand isolates.¹² They found that 49% of phones grew one bacterial species, 34% grew two different species and 11.5% grew three or more different species and no bacterial growth was found in 5.5% of phones. *S. aureus* strains isolated from mobile phones and from hands were 52.0% and 37.7% meticillin resistant respectively. While Gram-negative strains isolated from mobile phones and from the hands were 31.3% and 39.5% ceftazidime resistant respectively.

Similarly Elkholy and Ewees stated that the rate of mobile phone contamination was 96.5%.³ The isolated microorganisms from mobile phones and hands were similar. They found that, 42% of phones grew one bacterial species, 29% grew two different species and 25.5% grew three or more different species and no bacterial growth was identified in 3.5% of phones. Forty eight % of *S. aureus* isolated from mobile phones and 31% of *S. aureus* isolated from hands were meticillin resistant. While 30% and 32% of Gram-negative strains isolated from mobile phones and hands were ceftazidime resistant respectively.

Jeske *et al.* found that the rate of bacterial contamination of HCWs' hands was 95% while that of mobile phone was 90%.¹¹ Tambekar *et al.* stated that 95% of mobile phone showed bacterial contamination and among *S. aureus* isolates 83% were meticillin resistant.⁶ Snigh *et al.* reported that out of 50 mobile phones that were cultured, 98% were positive.¹³ On the same context, Goldblatt found that, one fifth of the cellular phones used by HCWs harboured pathogenic microorganisms and may serve as vectors for health care transmission of microorganisms.¹⁴ Fukada reported that anaesthetists should perform hand hygiene before and after anaesthesia and remove gloves after each procedure and before using any equipment.¹⁵

Lower rates were observed by Ramesh *et al.* who stated that 45% of mobile phones which were swabbed grew microorganisms.⁷ Similarly, Ali *et al.* found that 43.6% of HCWs carried infective microorganisms on their cell phones and they recommended that cell phones should be cleaned regularly.¹⁶

A major education campaign should be undertaken. This should emphasize the importance of hand washing after mobile phone use, raise awareness about mobile phones role as possible vehicle for transmission of different pathogens inside the hospital and also to the outside community, hence increasing the problem of multidrug resistance. This education campaign should be assessed periodically by microbial sampling of mobile

phones used in the hospital. If such sampling shows that mobile phones continue to be contaminated, additional strategies will have to be considered.⁷ Routine cleaning of mobile phones with alcohol disinfectant wipes⁷ or antimicrobial additive materials may be effective in reducing the risk of cross-contamination.¹⁷ In the future, mobile phones could be produced with protective material against bacterial contamination.¹²

A limitation of this current study is that bacterial counts of the isolated microorganisms were not done and this may interfere with the assessment of the level of contaminating microorganisms present per square cm.

In conclusion, mobile phones may act as a reservoir of microorganisms associated with HAI that can be transmitted into the operating environment by medical staff as same organism was cultivated from both the mobile phone as well as the hand of the same healthcare worker. Restriction of mobile phone use in clinically sensitive areas, such as operating environment and ICU as a start point, is recommended. Moreover, screening of HCWs' mobile phones inside the hospital should be done while doing environmental screening.

Table 1. Different bacterial isolates isolated from mobile phones and HCWs' hands after using the mobile phones.

Isolated pathogens	Mobile phone n = 30(%)	HCWs' hand n = 30(%)
CoNS	10 (33.3)	10 (33.3)
<i>S. aureus</i>	5 (16.6)	7 (23.3)
<i>S. aureus</i> + <i>B. anthracoid</i>	2 (6.6)	-
<i>K. pneumoniae</i>	8 (26.6)	5 (16.6)
<i>K. pneumoniae</i> + CoNS	-	3 (10)
<i>Serratia marsecens</i>	2 (6.6)	2 (6.6)
<i>Proteus mirabilis</i>	3 (10)	3 (10)
Total	32	33
CoNS = coagulase negative staphylococci		

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