



## HEALTH CARE WORKERS-MOBILE PHONES A POTENTIAL SOURCE OF BACTERIAL CONTAMINATION

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### ABSTRACT

Mobile communication devices help accelerate in-hospital flow of medical information, information sharing and querying, and contribute to communications in the event of emergencies through their application and access to wireless media technology. Healthcare-associated infections remain a leading and high-cost problem of global health systems despite improvements in modern therapies. Our aim was to determine the mobile phones contamination among Health Workers. 80 Health Workers at Sri Lakshmi Narayana Institute of Medical sciences, puducherry were enrolled in the study. Swabs from fingertips and keypads of mobile phones were taken using moist sterile swabs and plated on Mac Conkey and Blood agar plates. The bacteria isolated were identified by biochemical tests. A significant number of mobile phones in the Operation Theatre were found to be contaminated with bacteria. Most of these bacteria though are nonpathogenic in normal circumstances but may become significant among the patient population. Daily disinfection practice of mobile phones of all Health Care Workers should be part of Operation Theatre safety protocols for prevention of infection. It is important to encourage higher compliance to hand washing practices and routine surface disinfection of personal use items brought to the operation theatre. Mobile phone disinfection should be part of infection prevention protocols in Operation Theatre.

**KEYWORDS :** Bacterial Contamination, Nosocomial Infections, Mobile Phones, HealthCare Workers, Contamination.

### INTRODUCTION

The rapid progress of modern technology has contributed not only to medical fields, but also to the development of technologies for individual use. This technology includes personal computers, pagers, mobile hand-held devices (MHDs) (wireless tablets such as iPad, droids, etc.) and mobile phones (MPs), in which improvements have been made at a staggering speed over the past 20 years [1-3]. MPs and MHDs help accelerate in-hospital flow of medical information and information sharing and querying, and contribute to communications in the event of emergencies through their application and access to wireless media technology [1,2]. As technology in this area has evolved, MHDs that provide laboratory and imaging results, patient data, and photographic images are being used by physicians during bedside rounds to engage clinicians, residents, and students. Healthcare workers (HCWs) access pharmaceutical knowledge and literature by MPs and MHDs, which facilitates learning and clinical performance [4,5]. It is possible, with advanced mobile communications, to closely monitor diseases, such as diabetes and asthma, even without requiring the patient's presence in the hospital. MPs provide unique facilities for situations, such as the treatment of travel infections, vaccinations, and the remote control of epidemics [4,5]. MPs essentially provide access to health workers without limitation to facilitate communication with patients.

Mobile phones (MPs) are becoming commonplace in both community and hospital settings. More than 50% of healthcare workers (HCWs) admit using MPs (either personal or professional devices) in their clinical environment and practice, including during physical contact with patients [6-9]. The use of MPs can improve the quality, rapidity and efficiency of communication in healthcare settings [6]. Approximately 2 million nosocomial infections occur in the USA [1]. Bacterial contamination on these devices has been described [6], with up to 25% of MPs being found to be contaminated [10]. Nosocomial bacteria such as methicillin-resistant *Staphylococcus aureus*, *Acinetobacter* species, vancomycin-resistant enterococci, *Pseudomonas* species and coliforms have been retrieved from MPs [7,10-12]. These devices may thus serve as a reservoir of bacteria known to cause nosocomial infections [9-10] and may play a role in their

transmission to patients through the hands of HCWs [13].

Healthcare-associated infections (HAIs) remain a leading and high-cost problem of global health systems despite improvements in modern therapies. The source is usually defined by the transfer of microorganisms between clinicians, patients, devices, and general surfaces. In daily routines, hands of HCWs are often contaminated by pathogens, and inadequate hand hygiene can allow the transfer that will result in HAIs. Telephones are rarely cleaned after handling and may transmit microorganisms, including multiple resistant ones, after contact with the patient, and can be a source of the bacterial cross-contamination [14-17].

These mobile phones harbor a wide array of microorganisms which includes Coagulase negative *Staphylococci* (CONS) *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Acinetobacter* species, *Enterococcus faecalis*, and *Pseudomonas aeruginosa*. [9-10]. Multidrug resistant strains like Methicillin resistant *Staphylococcus aureus* (MRSA) and Extended spectrum beta lactamases producing organisms (ESBL), high-level aminoglycoside-resistant *Enterococcus*, and carbapenem-resistant *Acinetobacter baumannii* [17-18] have also been isolated from mobile phones. Majority of the staff neither clean their mobile phones regularly nor wash hands after using these mobile phones [18]. There are no restrictions on the use of mobile phones in the hospital setting and no guidelines have been formulated on cleanliness of mobile phones in the healthcare settings. Further sharing of mobile phones between the hospital staff may distinctly facilitate the spread of potentially pathogenic bacteria to the community. Operation Theatre (OT) of any hospital offers cleanest and sterile environment for patients undergoing surgeries. The cell phones are possessed by all HCWs working in OT. 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.

Our study was conducted with the aim to screen the mobile phones of health-care personnel for various bacteria and fungi with special reference to methicillin-resistant *Staphylococcus aureus* (MRSA), *Staphylococci*, *pseudomonas*, coagulase negative staphylococci and *pseudomonas* and to evaluate the amount of contamination of the hand and mobile phones in anaesthetists working in the operation theatre and formulate suitable guidelines for their decontamination to screen the mobile phones of healthcare workers so as to elucidate all possible contaminants which can act as a source of infection, with their antibiotic resistance pattern.

## MATERIALS AND METHODS

80 Health care workers working in the operation theatres at Sri Lakshmi Narayana Institute of Medical sciences, puducherry were enrolled in the study. Study includes Doctors and Nurses from surgical operation theatre. Consent was obtained from the Doctors before inclusion in the study. Samples from mobile phones and fingertips were taken by sterile wet (sterile distilled water) swab stick. Microbiological cultures of all the samples were done and culture growths were subjected to antibiotic sensitivity. The procedure of specimen collection was explained to the volunteers and a questionnaire was filled after obtaining informed consent. Institute Ethical clearance for the study was obtained from the Ethical review committees of Sri Lakshmi Narayana Institute of Medical sciences, Puducherry. The swabs were in the laboratory to inoculate 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). 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.

## RESULTS

**Table.1:** Shown Microorganism isolated from mobile phones from Health care workers.

Microorganism isolated from mobile phones	Health care workers (n=80)
<i>Staphylococcus aureus</i>	12 (15%)
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)	8 (10%)
<i>Pseudomonas</i>	4 (5%)
<i>Candida</i>	0
Coagulase negative staphylococci	12 (15%)
<i>Bacillus subtilis</i>	4 (5%)
Total	40 (50%)

## DISCUSSION

In this study we assessed the contamination of anaesthetists and Nurses 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. 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.

In present study, microorganism contamination rate of mobile phones were 50 %. The predominant pathogenic

microorganisms isolated from the mobile phones of Doctors of Surgery department were *Staphylococcus aureus*, followed by Methicillin-resistant *Staphylococcus aureus* and *Pseudomonas*. In present study, Methicillin-resistant *staphylococcus aureus* and *Pseudomonas* both were important nosocomial microorganisms isolated from mobile phones of Doctors in our surgical department. Doctors are carrying their mobile phones with pathogenic microorganisms to their surgical outpatient department, surgical wards, surgical intensive care unit, surgical operation theatre, surgical post operative ward and also to their homes. Further study may be required to find out whether Mobile phones of Doctors are involved in transmitting nosocomial infection. Other studies had also shown contamination of White coats of Doctors, Security Swipe Cards and Scanners of Hospital, Stethoscope of Doctors by pathogenic microorganism [18-21].

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. Generally majority of the doctors and Nurses used personal items such as mobile phones, Pens and wrist watches during the theatre sessions. Studies investigating personal items such as mobile phones, wrist watches, stethoscopes, pens and ties of doctors and Nurses have been shown to harbour nosocomial pathogens. 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.

The present study reports were obtained Hand washing was performed by 50% (n=40/80) doctors and Nurses entering the theatre. 95% (n=76/80) brought their mobile phone to the theatre and 80% used it at least once during the theatre session. Bacterial growth was detected from mobile phone swabs. *Staphylococci* were predominantly cultured from all the specimens tested. *Staphylococci* 15%, Methicillin-resistant *Staphylococcus aureus* (MRSA) 10%, *pseudomonas* 5%, coagulase negative staphylococci 15%, *pseudomonas* 5% and total 50% anaesthetist, other doctors and Nurses mobile phones growth were detected. Doctors and Nurses should be aware that their personal objects used in the hospital environment may be contaminated by pathogenic microorganism. Few studies were done in Nurses but we didn't concentrate in this study on Nurses.

Our study revealed that almost 50% of the doctors and nurses used their mobile phones during the operation theatre shift. In present study, microorganism contamination rate of mobile phones were 50 %. The predominant pathogenic microorganisms isolated from the mobile phones of Doctors and Nurses of Surgery department were *Staphylococcus aureus*, followed by Methicillin resistant *Staphylococcus aureus* and *Pseudomonas*. In present study, Methicillin-resistant *staphylococcus aureus* and *Pseudomonas* both were important nosocomial microorganisms isolated from mobile phones of Doctors and Nurses in our surgical department. Doctors and Nurses are carrying their mobile phones with pathogenic microorganisms to their surgical outpatient department, surgical wards, surgical intensive care unit, surgical operation theatre, surgical post operative ward and also to their homes. Further study may be required to find out whether Mobile phones of Doctors and Nurses are involved in transmitting nosocomial infection. Other studies had also shown contamination of White coats of Doctors, Security Swipe Cards and Scanners of Hospital, Stethoscope of Doctors by pathogenic microorganism [21-26].

**CONCLUSION**

A significant number of mobile phones in the Operation Theatre were found to be contaminated with bacteria. Most of these bacteria though are nonpathogenic in normal circumstances but may become significant among the patient population. Daily disinfection practice of mobile phones of all Health Care Workers should be part of Operation Theatre safety protocols for prevention of infection. Doctors and Health Care Workers (Nurses) both should be aware that they may carry pathogenic microorganism on their mobile phones. Cleaning of mobile phones with antiseptic solution along with emphasis on correct hand-washing technique should be given. Use of hands free kit for mobile phones may be useful in preventing direct contact of hands with mobile phones in hospital. Bacterial contamination on mobile phones may be reduced by making them with special material which prevents growth of microorganism which required further research. Developing active preventive strategies like routine decontamination of mobile phones with alcohol containing disinfectant materials might reduce cross-infection. Another way of reducing bacterial contaminations on mobile phones might be the use of antimicrobial additive materials. We could easily avoid spreading bacterial infections just by using regular cleaning agents and rearranging our environment. Further studies are required in the Large number of doctors and other Health Care Workers and they are more contaminated by their mobile and other objects.

Adoption of new communication technologies will always be a part of clinical medicine and healthcare facilities, and there will always be cross-contamination risks of mobile communication devices. Finally, new designs and technologies, especially new materials to reduce handling, contamination, and to ease cleaning, are welcome. A significant number of mobile phones in the Operation Theatre were found to be contaminated with bacteria. Most of these bacteria though are nonpathogenic in normal circumstances but may become significant among the patient population. Daily disinfection practice of mobile phones of all Health Care Workers should be part of Operation Theatre safety protocols for prevention of infection.

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