Brief communication

BACTERIAL CONTAMINATION OF HOSPITAL TELEPHONES

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ABSTRACT

Objective: To assess the contamination of phones in different wards of one academic hospital in order to find out the association and pattern of the contamination with seasons, wards, and cleaning methods used.

Methodology: Samples were collected in a six months period. The samples were collected on a specified day on each month and at two different times of day. Samples were taken from mouthpiece and earpiece of the phones and were used for culture.

Results: *S.epidermidis* was the most common bacterium cultured in each month and in each ward. Contamination of mouthpiece was more common than earpiece.

Conclusion: Considering the possibility of transmission of the contamination via phones by people who use them and in order to reduce the burden of nosocomial infections, special attention should be directed toward disinfection of the phones as well as other hospital devices.

KEYWORDS: Bacterial contamination, Telephone, Hospital.

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INTRODUCTION

Nosocomial infections (NI) are among the leading health problems of the current century.[1-4]

According to the literature, nosocomial infections are common with estimates at more than two million cases annually in the USA.[1] The condition results in increase in illness, mortality, hospital stay, and health care costs.[1,2,4,5] There is a wide spectrum in the rate of NI from 14.8% to 71%.[1] In 1990 in Spain, the prevalence of NI was 9.87% and in 2006 it was 7.9%.[2] NI contributed to death of more than 88,000 people in 1995; this equals to one death in every six minutes.[1] Among the 1945 patients who died during the study of Kaoutar et al, 2004, 26.6% had an NI. According to the agreed diagnosis, NI contributed to the deaths of 284 (14.6%) patients thereby ranking NI the 4th most frequent cause of death.[5] Since the 1970s , NI have been associ-

ated with 80000 deaths per year and are ranked as the 11th most common cause of hospital death in the USA (5,6,7). Extrapolation based on these data would indicate that 10,000-12,000 deaths per year in France are associated with NI.[5,8] In 1995, costs estimate were as much as $4.5 billion in USA.[1] Therefore, it is implied that even minor interventions for controlling nosocomial infections will be cost effective.[1] Hospital stay is increased by 10 to 30 days depending on the type of the infection, meanwhile some other patients expire due to lack of access to free hospital beds.[1] Contamination of devices and instruments of hospitals, including the phone may contribute to acquiring infection. Phones in the inpatient wards, outpatient wards, and administrative buildings are used by many people every day. Infectious microorganisms may be transmitted to the phone from contaminated people and then be transmitted to the patients by the health care staff who use these contaminated devices. Tunc et al. 2006 showed that public phones are contaminated with various bacteria, such as *Staphylococcus aureus, Staphylococcus epidermidis, Escherichia coli, and even Neisseria Gonorrhea*.[9] In this study we have assessed the contamination of phones in the inpatient, outpatient wards, and the administrative buildings of Imam Khomeini hospital, one of the academic hospitals of Tehran University during different times of the day times and in different months in order to show the microbiologic patterns of contamination of the phones. We have also assessed the association of pattern of the contamination with seasons, wards, and cleaning methods used.

METHODOLOGY

This cross sectional study was performed in six months in three seasons of autumn, winter, and spring from December 2008 to May 2009 at the Imam Hospitals complex, in Tehran. This is one of the teaching hospitals affiliated with the Tehran University of Medical Sciences. Sampling was carried out by a microbiologist with sterile swabs at 8am and 4pm in a specified day of each month. The samples were taken from mouthpiece and earpiece of the phones and were transferred to the laboratory within 15 minutes. Phones of the neonatal, pediatric, endocrinology, gynecology, hematology, ear-nose- throat, general surgery, thoracic surgery wards, special care wards including neonatal intensive care unit (NICU), intensive care unit (ICU), and bone marrow transplantation (BMT), paraclinic units including pharmacy and laboratory and also administrative buildings including information unit, reception, accountancy, and nursing office were covered in the study. Samples were cultured in Eosin methylene blue (EMB), Salmonella-Shigella (SS), Klinger's Iron (KIA) triple sugar iron (TSI), 5%sheep blood agar (BA), and chocolate agar media. Processing and detection of bacteria was performed according to the standard microbiologic methods and algorithms.[10] The data was analyzed by SPSS 13 software and chi square test was used for assessing the significance. Research deputy of Tehran University of Medical Sciences confirmed the ethical issues of the experiment.

RESULTS

In this study 300 samples were collected from mouthpiece and 300 samples were collected from earpiece of the phones. Table-I summarizes percentage and type of bacterial contamination of the mouthpiece and earpiece of the phones according to the different months. The most common bacteria found in both mouthpiece and earpiece was *S. epidermidis*, comprising 60% of all contaminations. Contamination of the mouthpiece was more than earpiece. This bacterium was the most common bacteria contaminating the phones in each month and was cultured in all inpatient wards, paraclinic units, special care units, and administrative buildings. Contamination with *S. pneumonia* and *K. pneumoniae* was observed in winter and gradually decreased by approaching spring. These bacteria were found more commonly in the mouthpiece and were also cultured from the phones in the inpatient wards, paraclinic units, and administrative buildings.

Contamination with *S. aeruginosa* was evident in autumn and winter, with a higher rate in

Table-I: Microbial contamination of mouthpiece and earpiece of the phones in different months

Microbial contamination %	*Dec*		*Jan*		*Feb*		*Mar*		*Apr*		*May*	
	M	*E*	*M*	*E*	*M*	*E*	*M*	*E*	*M*	*E*	*M*	*E*
S. epidermidis	17	6	18	13	14	8	11	4	15	8	16	11
S. aureus	2	1	1	-	1	-	4	1	1	1	-	-
S. pyogenes	4	1	2	1	1	1	6	2	7	3	8	3
S. pneumoniae	1	0	2	2	3	2	4	1	2	1	-	-
E. coli	-	-	1	-	1	-	2	1	1	-	-	-
P. aurgenosa	1	1	-	-	-	-	-	1	-	-	-	-
K. pneumonia	-	-	1	1	4	1	4	3	2	1	-	-

M = mouthpiece
E = earpiece

mouthpiece of the phones. This bacterium was only cultured from the phones in ICU and BMT. *E. coli* contamination was more commonly seen in winter and spring and in mouthpiece. This organism contaminated the phones in the inpatient and special care units at a higher rate. *S. aureus* contamination was spread in all months and was not significantly higher in special month. This bacterium contaminated the phones of the inpatient and special care units more frequently and was more common in the mouthpiece of the phones.

DISCUSSION

Two million cases of nosocomial infections occur annually in USA increasing mortality, hospital stay and costs of health cares for the patient.[1] Mortality rate following a nosocomial infection has a wide range from 14.8% to 71% depending on the infection type.[1] As noted previously, these infections are a major health problem especially in developing countries.[1-4] One strategy for reducing nosocomial infections is considering and focusing on their transmission via instruments in the hospital. Phones are one of the devices which may contribute to transmission of nosocomial infections, however they are often neglected. Phones are available in all hospital wards and many health care staff including doctors, nurses, other employees and patients use them frequently.

In a study in Turkey, Tunc *et al.* showed that contamination rate of mouthpiece is more than the earpiece of the phone.[9] Similarly, as shown in Table-I, we also observed a higher rate of contamination with the mouthpiece. The contact of mouthpiece to the exhaled air may contribute to this. As Tunc *et al.* reported, the maximum rate of contamination was during May and June and it subsequently decreased in following months.[9] In contrast we found that contamination rate of some bacteria such as *S. epidermidis* is high in all of the months, and this contamination rate is relatively similar in all months. On the other hand contamination with some other bacteria such as *S. pneumoniae* and *K. pneumoniae* peaks in February, March, and April and subsequently decreases gradually. The increase of the contamination rate with these organisms in the aforementioned months may be due to cold weather of Tehran in these months. Warming the weather may play an important role in reduction of contamination rate with these bacteria.

We also found that the contamination rate is higher in 4pm than 8am; this may be in part due to more use of the phones in the day time. Similar results were observed in other studies. We observed that contamination with highly infective organisms occurs in special wards such as ICU, NICU, BMT; this may reflect the presence of patients with specific conditions in these wards. Singh *et al.* reported a contamination rate of 47% in mouthpiece of the phones examined.[11] This rate is lower than what we observed.

Cozanitis *et al.* conducted a study on contamination of the phones of the ICUs. They found that the contamination is transmitted via

contact with hands, throats and nose of the health care staff.[12] Actually, the main route of transmission is via contact of the people with contaminated areas; contact of a person with phone may transmit an infectious organism to that person. Therefore, we may reduce the high burden of nosocomial infections by controlling the contamination of the phones. One approach may be changing the design and structure of the phones of the hospitals. Mouthpieces with fewer holes may be used and applying disposable covers on the mouthpiece (which are disposed at the end of everyday) may be useful. Designing phones which do not finger contact need for dialing is another way for reducing contamination. More essential is applying antiseptic materials on the external parts of the phones. It is suggested to use potent antiseptics for this purpose.

In this study we observed high contamination rate of the phones. However, it is wise to reduce these contaminations and consequently nosocomial infections via simple cost-effective methods. Evaluating the effect of the use of antiseptic agents on contamination rate of the hospital phones in a greater study may lead to more powerful evidence for the role of controlling transmission route in reducing burden of the nosocomial infections.

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