

Bacterial contamination of anaesthetists' hands by personal mobile phone and fixed phone use in the operating theatre

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Summary

Following hand disinfection, 40 anaesthetists working in the operating room (OR) were asked to use their personal in-hospital mobile phone for a short phone call. After use of the cell phone, bacterial contamination of the physicians' hands was found in 38/40 physicians (4/40 with human pathogen bacteria). After repeating the same investigation with fixed phones in the OR anteroom 33/40 physicians showed bacterial contamination (4/40 with human pathogen bacteria). The benefit of using mobile phones in the OR should be weighed against the risk for unperceived contamination. The use of mobile phones may have more serious hygiene consequences, because, unlike fixed phones, mobile phones are often used in the OR close to the patient.

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Nosocomial infections are a serious problem in all modern hospitals [1]. As early as 1861, Semmelweis showed that bacteria are transmitted to the patients by the contaminated hands of healthcare workers [2]. In public opinion, hospital operating rooms (OR) are the workplaces with the highest hygiene standards. The same high hygiene requirements also hold for the personnel working there and the equipment used by them.

Mobile phone use was forbidden in the OR for a long time [3]. However, for several years now their use has become commonplace, above all because of the lack of reports on serious problems in connection with them [4]. In Austria, the University Hospital in Innsbruck lifted its ban on mobile phones in 2000. A survey of doctors performed in 2004 in an English teaching hospital found that 64% had their telephones on in 'high risk' areas such as operating theatres and high dependency units containing vital electronic medical devices [5]. The results of a recent survey of practice in selected European countries also underline the safety of the use of mobile phones in hospitals and reported a trend to relaxation of regulations [6].

Mobile phones are used in close contact with the body and, as for most non-medical electronic equipment, there are no cleaning guidelines available that meet hospital standards, and the hygiene risk involved in using mobile phones in the OR has not yet been determined.

The purpose of this investigation was to evaluate the role of mobile phones in relation to the transmission of bacteria from the mobile phone to the physician's hands. By comparison, the same experiment was performed using wall-mounted phones installed in the OR anteroom.

Method

The investigation was approved by the University Ethics Committee, and written informed consent was obtained from the study participants. Following 4–6 h of routine work in the OR, 40 anaesthetists were asked to disinfect their hands using an alcohol-based hand rub (Sterilium[®], Bode Chemie, Hamburg, Germany). Cultures were subsequently obtained from the fingers of both hands by covering agar plates with five fingertips to document properly cleaned hands. After a subsequent, approximately 1-min phone call on the physician's personal in-hospital mobile phone, sampling was repeated using the fingers of the hand used by the physician to make the call. The same experiment was performed later using wall phones in the OR anteroom.

In addition, specimens were also collected from the keypad of the mobile phone and the keypad of the wall phones using the Rodac[®] (trypticase soy agar, Merck, Germany) plate technique. The sampled area was touched

approximately three to five times with a Rodac plate to ensure that the entire 16-cm² area was sampled. Rodac plates and 5% sheep blood agar plates were incubated at 37 °C for 48 h. Isolated microorganisms were identified using gram stain, pigmentation, colony morphology, catalase, motility, esculin hydrolysis, Staphaurex Plus[®] (Remel Europa Ltd, Dartford, UK) and Api-System (bioMerieux[®], Marcy-l'Etoile, France).

Results

Following the use of an alcohol-based hand rub, culture sampling documented correct cleaning of all physicians' hands at the beginning of the investigation. Following use of a mobile phone or a fixed phone the rate of bacterial contamination of the physicians' hands increased to 38/40 and 33/40, respectively. The keypads of the mobile phones (36/40) and of the fixed phones (38/40) contained non-human pathogen as well as human pathogen bacteria. Hand contamination rates of physicians after phone use and culture results are shown in Table 1.

Discussion

In this pilot study, the use of mobile or fixed phones by anaesthetists working in the OR not only demonstrated a high contamination rate with non-human pathogen bacteria but also, more importantly, also caused a 10% rate of contamination with human pathogen bacteria.

Recent work has indicated that telecommunication devices can not only be used safely in the hospital environment but also, compared to conventional pager systems, mobile phones may have a beneficial effect on communication and therefore improve the quality of patient care in the intensive care unit (ICU) [7]. However, this finding refers solely to technical aspects and gives no consideration to hygiene.

As the use of electronic devices (i.e. mobile phones, personal digital assistants) have become commonplace in the OR and ICU in recent years, these devices are being

increasingly used in close proximity to the patients. Equipment use in these areas is naturally subject not only to high technical but also high hygiene standards. However, whilst other items such as the stethoscope and the ball point pen have already been investigated as possible sources of nosocomial infection and have been found to be contaminated with clinically significant microorganisms (including human pathogen bacteria) [8, 9], mobile phones have not yet been investigated in this respect.

Interesting in this connection is the observation made by Smith et al. [8] that stethoscopes designated for single room use were statistically significantly less frequently contaminated (45%) than were the physicians' own personal stethoscopes (90%). This is probably due to the fact that a physician's stethoscope is not included in routine hospital cleaning, but it also underlines the high risk of contamination entailed when using 'personal' work tools such as stethoscopes, ball point pens and even mobile phones.

There are no recommendations for cleaning mobile phones to meet hospital standards. Cell phone manufacturers even warn explicitly against using cleaning agents. The use of disinfectable protective covers similar to the PC keyboard protector membranes used in the OR may not be practical, namely, because a person's personal mobile phone, unlike a PC keyboard, does not undergo any regular standardised cleaning and, more importantly, because for reasons of anatomy the mobile phone as well as the hand holding it come into close contact with strongly contaminated body areas (mouth, nose, ears) during every phone call.

In a previous investigation, Rafferty et al. [10] found a 7% rate of bacterial contamination with potentially pathogenic bacteria when investigating telephones, intercoms and dictaphones used in patient care areas. Although those results correspond with ours, it should be remembered that, unlike the telephones studied by Rafferty et al., mobile phones in the OR are often used in immediate proximity to the patient; this may therefore be questionable from the standpoint of hygiene. The results of our study indicate that the potential benefit from using a phone in general and a mobile phone in particular in the OR or in the ICU must be weighed against the risk of unperceived contamination and infection.

Table 1 Hand contamination rates of physicians after phone use.

	Hand contamination after use of	
	Mobile phones (n = 40)	Fixed phones (n = 40)
Non-human pathogen bacteria	38/40	33/40
Human pathogen bacteria	4/40	4/40
CFU (median)	14	22

Human pathogen bacteria: *Staphylococcus aureus* sp., *Enterococcus* sp., *Acinetobacter* sp.
CFU, colony-forming units on the agar plate or the Rodac plate.

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