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An investigation of radiographers' mobile phone use and the success of an awareness campaign at reducing the nosocomial infection risks

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ABSTRACT

Introduction: Mobile phone use by healthcare workers (HCWs) is widespread. Studies have shown that HCW's mobile phones can harbour pathogens associated with nosocomial infections. This study investigated whether an awareness campaign will result in an improvement in radiographers' phone and hand hygiene practices.

Methods: Radiographers working in the general department of two university hospitals were invited to participate. One hospital was assigned as the experiment hospital and the other as a control. In the experiment hospital, adenosine triphosphate (ATP) testing of each participant's mobile phone determined the cleanliness of its surface. A corresponding survey was completed to determine their current practices and level of awareness. Subsequently, an infection control poster campaign took place for a one-month period, followed by re-testing. In the control hospital, the ATP testing and survey were also completed before and after a one-month period, but without a poster campaign.

Results: Radiographers were generally unaware of the infection risks associated with mobile phone use with 44% of all participants never cleaning their phone. The campaign successfully improved phone hygiene frequency and method in the experiment hospital. However, it did not improve hand hygiene practices and actual phone cleanliness (mean ATP count reductions of 10% (experiment hospital) and 20% (control)). The ATP testing as a less direct form of intervention showed similar levels of success in comparison to the poster campaign.

Conclusions: A multifaceted educational approach is likely to be most effective in raising awareness and changing radiographers' phone and hand hygiene practices.

Introduction

Hospital acquired infections (HAIs) are a major healthcare concern. In Europe, they result in 16 million extra-days of hospital stay with an associated cost of €11 billion.[1] They also reduce the patient's quality of life and can prove fatal.[2] However, the World Health Organisation states there is strong evidence suggesting that up to 50% are avoidable.[1] Ireland has 12 national standards targeting HAIs, but there is little focus on specific risks, such as mobile phone use within the clinical environment.[3]

Mobile phones are an ideal breeding ground for bacteria due to their constant contact with the hands coupled with the heat generated by the phone itself.[4] The average rate of pathogen contamination is 9–25% with pathogens such as MRSA (1–10%) and *Acinetobacter species* (1–12%) residing on the phone's surface.[5]

Reducing the 'bio-transfer potential' is of great importance when mobile phones have the capacity to harbour nosocomial pathogens and hands have a transfer potential.[5] Performing adequate hand hygiene, prior to and following mobile phone contact, breaks the chain of infection. Several recommendations advise correct hand hygiene following phone use and regular phone disinfection using 70% isopropyl alcohol[6] as preventative measures. However, these recommendations are not well known nor followed.[7,8]

Hand hygiene prior to phone use can also reduce the potential number of microbes harbouring on the phone. It's likely omitted from recommendations because hand hygiene following phone use is a more understandable concept for health care workers (HCWs)

Abbreviations: HCW, Health Care Worker; ATP, Adenosine Triphosphate; HAI, Hospital Acquired Infection; HSE, Health Service Executive; RLU, Relative light Units.

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and it is not practical (i.e. the HCW is unlikely to clean their hands before answering the phone) and the phone will harbour pathogens due to the surroundings regardless. Therefore, this study will also focus upon hand hygiene following phone use because the aim is to improve hygiene compliance in order to reduce the potential transmission of HAIs to patients.

During the literature review, no study referencing the radiology department could be found. The lack of attention paid to the radiology department is worrying as radiographers are in contact with a large volume of outpatients and inpatients and regularly frequent the intensive care and surgical areas, allowing for a greater opportunity for infection spread.

HCWs employed by the Health Service Executive (HSE) in Ireland must switch off their personal mobile phone at work unless permission has been granted by their manager for exceptional or urgent reasons.[9] While this rule is likely to be in place to for numerous reasons, for example to avoid any potential interference with medical equipment[10] or to simply avoid distractions, anecdotal evidence suggests that it is not enforced. With mobile phones becoming an integral part of healthcare and used by HCWs for work related matters, ensuring that the benefits of phone use outweigh the risks is of utmost importance. Such changes in policy are unlikely unless there is evidence to prove that an intervention will be successful. Staff education, such as a poster awareness campaign, is recommended as a possible awareness tool to improve practices.[5] Therefore, this study will investigate; does an awareness campaign aimed at reducing the spread of nosocomial infection through phone use result in an improvement in radiographer's phone and hand hygiene habits? The hypotheses to be tested are as follows;

- Radiographers currently do not perform weekly mobile phone disinfection measures in the clinical department.
- A mobile phone and hand hygiene poster campaign will result in an improvement in radiographers' mobile phone disinfection practices.
- Radiographers currently do not always clean their hands, using the HSE 15 second hand hygiene rule, following the use of their mobile phone in the clinical department.
- A mobile phone and hand hygiene poster campaign will result in an improvement in radiographers' hand hygiene practices following mobile phone use.

Method

Exemption from ethical approval was sought and granted from the local research ethics committee, and permission obtained from the relevant radiology services managers. The hypotheses were investigated using a deductive approach. A poster campaign relating to phone use was utilised as the main form of awareness.

Numerical data in the form of adenosine triphosphate (ATP) readings determined the contamination load on the mobile phones. A Charm NovaLum ATP meter was sourced with corresponding PocketSwab Plus swabs.[11] ATP is a basic source of energy for all plant, animal, and microbial cells. Upon swab activation, a reaction catalysed by luciferase produces light which is detected by the ATP meter. The amount of light generated is proportional to the amount of ATP present, expressed as relative light units (RLU). Therefore, a large quantity of ATP indicates poor cleaning of the surface.[12] While an ATP meter cannot be used accurately to assess sterility, it allows for real time information on general cleanliness of a surface with the quantitative nature of the results allowing for comparisons between pre- and post-cleaning of the surface.[13]

In order to ensure that there would be validity, consistency and accuracy of the ATP readings, the meter's specifications were reviewed combined with preliminary equipment testing. The specifications were reviewed using a recent study examining ATP meters.[14] The study established that the Charm NovaLUM demonstrated acceptable linearity of its readings (correlation between actual ATP amount and ATP meter reading values of 0.8230).[14] However, problems with its sensitivity to detect lower levels of viable microorganisms were noted. Pilot testing which involved swabbing of a single mobile phone before and after phone disinfection, recorded RLU values which exceeded 1000 RLU which confirmed adequate sensitivity for this work. Calibration as per the user manual was performed before use.

Categorical data in the form of survey results determined phone and hand hygiene practices. The 18-question survey examined participant demographics, their phone type, current phone and hand hygiene practices and awareness. The survey was designed using commercial online survey software, Survey Gizmo. It was downloaded on a tablet for self-completion by participants while their phone was swabbed. Both data collection methods were first piloted using a sample of radiographers ($n = 2$) to determine their appropriateness, with no issues identified.

Sample

The population encompassed radiographers working in the general department of tertiary university hospitals in Ireland ($n = 8$). Tertiary hospitals were focussed upon because they have the highest prevalence of nosocomial infections.[15] General departments were chosen because they have the highest patient turnover rate so the potential to spread nosocomial infection is potentially greater (i.e. 112,576 exams in general v 21,662 exams in CT[16]). The sample from this population was convenient in nature due to timing and financial constraints. Of the 8 hospitals, 3 were excluded based on location. From the remaining 5 hospitals, 2 were randomly selected with one randomly assigned as the experiment hospital and the second as a control.

Campaign

An A3 sized poster style campaign was designed because it allows for constant visual reminders while being one of the cheapest methods available (Fig. 1).

All radiographers working in the general department of both hospitals on the testing days were initially approached without prior warning as forewarning could cause participants to clean their phones. The participant completed the survey on a tablet while the phone was swabbed.

Accuracy in the swabbing technique was important for reproducibility and accuracy of the results. Pressure to the swab was applied on the surface, with the tip at a 30-degree angle, and continuously rolled to ensure all aspects of the swab came into contact with the surface. The swabbing was applied to the back and front of the phone in order to have 10 diagonal lines.

The swab was pushed down to pierce the micro-tube seal of the original tubing. The swab and tubing were shaken three times and placed in the upright ATP meter and the digital reading was recorded.

The poster campaign was then carried out in the experiment hospital only for a period of 4 weeks. Subsequently, the same participants were approached again in both hospitals and the swabbing and survey were repeated.

Statistical analysis

Data was analysed using SPSS 20[17] and ATP measurements were compared using Mann Whitney U-testing. Descriptive statistics as well as the Wilcoxon signed rank test were used to analyse the

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