

Evidence-based policy? The use of mobile phones in hospital

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ABSTRACT

Background Evidence-based policies have become increasingly accepted in clinical practice. However, policies on many of the non-clinical activities that take place in health care facilities may be less frequently evidence based.

Methods We carried out a review of literature on safety of mobile phones in hospitals and survey of practice in selected European countries.

Results When first evidence on the dangers of electronic interference associated with mobile phones appeared in the 1990s, hospitals in many countries introduced complete bans on mobile phones. Yet a review of recent evidence suggests that there is no significant risk from using mobile phones in hospitals as long as they are more than a metre away from sensitive equipment, whereas the risk to the most modern equipment is even less. With the technological evolution of mobile phones, the residual risk of interference appears to be minimal and controllable. Although some countries are reluctant to relax regulation, others now limit bans to areas in which sensitive equipment is used and some discourage the use of mobile phones on the grounds of noise exposure.

Conclusion With new technology on the doorstep, the potential benefits and risks associated with mobile phones should be examined explicitly in the light of the evidence.

Keywords cellular phone, electromagnetic interference, evidence-based medicine, mobile telephone, safety management

Introduction

The increasing acceptance of evidence-based medicine has been one of the greatest accomplishments of health systems in recent decades. Many countries now have systems to incorporate health technology assessment into their decision-making processes. Although there is considerable variation, in part reflecting differing cultural norms about professional autonomy, the use of guidelines to inform clinical practice has increased rapidly. Yet there are many aspects of health care that have been informed rather less by evidence. These include a myriad of norms and regulations about the organization of health facilities and the behaviour of those working in them. For example, a recent randomized controlled trial found that unrestricted visiting hours on an intensive care unit did not, as was widely believed, increase risks of infection; it actually reduced the risk of complications.¹ A Cochrane Review of the effectiveness of surgical face masks in preventing infections found no conclusive benefit from their use in clean surgery.²

One of the first signs to greet visitors to hospitals in many countries is one indicating that the use of mobile phones is banned. Yet a survey of American anaesthetists found widespread support for the view that mobile phones could reduce miscommunication and medical errors.³ Mobile phones also provide an easy and inexpensive means for relatives to communicate with patients, a resource that would be of particular benefit to patients in the United Kingdom, where, under pressure to raise funds, many hospitals have entered into

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lucrative deals in which a private company provides bedside phones that incur extremely high costs for those calling them,⁴ raising the question of whether bans are driven by ulterior motives. In this article, we examine the restrictions in place in a range of European countries and ask how these reflect the available evidence.

Methods

Information was gathered on practices in eight countries: Finland, France, Germany, Italy, Norway, Sweden, The Netherlands and the United Kingdom. Published literature was identified from various sources. We conducted a search of PubMed using combinations of the terms 'mobile phone*', 'cellular phone*', 'phone*' and 'hospital', with follow-up of references in published papers. To identify evidence of national policies and regulations on mobile phone use in hospitals, we undertook an iterative search of the World Wide Web using Google. We searched using terms in other relevant languages (e.g. 'Handy', 'Mobiltelefon', 'téléphone cellulaire', 'zaktelefoon' and 'telefono cellulare'). Authors also provided information from their own experience and enquiries with key informants in their own countries.

The evidence on safety of mobile phones

The safety of mobile phones in health care settings was examined in a recent systematic review published in January 2004.⁵ The review concluded that mobile phones using 900 and 1800 MHz frequencies could interfere with medical devices and thus potentially place patients at risk although clinically relevant electromagnetic interference from mobile phones was rare. However, as noted by the authors, a limited range of devices has been tested, and it was difficult to compare findings due to variations in study design and the heterogeneity of the technological information they provide. The following paragraphs update the findings of that review with studies published subsequently.

Mobile phone technology has evolved substantially over time. Several factors determine the risk of interference, including the frequency at which the mobile phone operates, the intensity of the signal and the shielding of medical equipment. Second-generation mobile phones use the Global Systems for Mobile Communication (GSM) standard, which has been supplemented by the General Packet Radio Service (GPRS) and Universal Mobile Telecommunication Systems (UMTS). These newer systems have lower power outputs and generate less interference, compared with first-generation analogue devices.⁶ At the same time, the susceptibility of equipment to interference is changing. Thus, newer equipment has

become less sensitive as manufacturers adopt increasingly stringent standards for screening,^{7,8} although some argue that these standards are still inadequate.⁹

The 2004 review had concluded that interference was largely limited to use within 1 m from medical equipment. More recent studies suggest that the risk of interference is minimal as close as 30 cm or less.^{8,10} Thus, in a laboratory study, six out of 14 mechanical ventilators malfunctioned in the presence of an analogue mobile phone but only when it was within 15 cm. One ventilator alarmed and stopped working when the phone was ringing at a distance of 30 cm, a failure which could potentially be life-threatening. However, with the exception of this malfunction, the interferences were not classified as clinically relevant.¹¹ Kanz *et al.*¹² observed no electromagnetic interference at any distance when exposing 12 automated external defibrillator models to mobile phones operating at 900 MHz. Another study involved exposure of 16 medical devices, including monitors, defibrillators, infusion pumps and ventilators, to six different types of analogue and digital mobile phones that used GSM and other types of second-generation technology common in the USA.⁸ Although interference was observed in over 20% of the tests, only 1.2% were considered clinically relevant. Comparing their findings to previous studies,¹³ the authors concluded that current mobile phones may be used much closer to other equipment than their predecessors.⁸

Looking ahead, a further challenge arises from the introduction of other communications devices. Wireless local area networks (WLAN) and systems based on Bluetooth technology offer low-output alternatives to conventional mobile phones, supplementing the long-standing and ubiquitous one-way pagers used in hospitals. The opportunities offered by these technologies to take advantage of electronic patient record systems create pressure for their widespread implementation.^{14,15}

One recent study has compared the effects of these different technologies, testing 79 life-supporting medical devices in laboratory and clinical settings.⁷ In that study, mobile phones operating on high-frequency GPRS created a significantly higher risk of electromagnetic interference than UMTS and WLAN systems. Most effects involved interference with displays and noise but were not considered to pose a risk to patients, with the possible exception of a GPRS phone causing an older infusion pump (purchased in 1991) to stop working at a distance of 50 cm.⁷ The authors thus concluded that the risk of interference is less with low-output devices such as WLAN than devices with higher outputs, such as GPRS mobile phones.

Similarly, Høgetveit *et al.*,¹⁴ testing 16 medical devices used in the operating theatre and exposed to WLAN technology,

found only small disturbances involving slight monitor flickers and some irregular behaviour among the communication devices, none of which found to be clinically relevant. Finally, testing the performance of five ventilators in 1-m distance from a two-way radio handset, digital mobile phones and a mobile phone operating on Bluetooth technology, Jones *et al.*¹⁶ found that the low-output Bluetooth phone showed the least interference. Although both the radio handset and the mobile phones caused display errors, no effect was observed when using the Bluetooth device. Yet, although the mobile phones did not affect the performance of the equipment materially, they did trigger a low-power alarm.¹⁶

In summary, there is a limited residual risk of clinically significant interference by mobile phones if used in close proximity of sensitive equipment. Furthermore, advances in communication technology mean that this risk is diminishing and, with the most recent technology, the risk seems to be minimal when >30 cm from such equipment. The next section examines the extent to which mobile phone use is permitted in hospitals in eight European countries.

Current practice across Europe

The use of mobile phones in UK hospitals was banned in the 1990s, prompted by the UK Medical Devices Agency alerting to the potential risks of interference with medical equipment.¹⁷ This policy was revisited by what is now the Medicines and Healthcare Products Regulatory Agency in 2004, proposing a more selective approach in which decisions would be a matter for the individual hospital. It suggested that phones should be switched off in intensive care and special baby units and near complex medical equipment.¹⁸ The agency has also recognized that a total ban is difficult to enforce and that mobile phones 'can be essential in hospitals for good patient management'.¹⁸ Indeed, one survey of doctors in an English teaching hospital found that the use of mobile phones was widespread, with 66% using their phones in the hospital, including in intensive care units and operating theatres.¹⁹ The revised guidelines are in accordance with the 2005 standards developed by the International Organization for Standardization (ISO).²⁰ However, despite being in effect for almost 2 years, hospital managers in the United Kingdom appear reluctant to revisit the restriction on mobile phone use on their premises.

Similarly, other countries in Europe had recommended banning the use of mobile phones in hospitals in the mid-1990s when evidence emerged that first-generation mobile phones could interfere with medical equipment.²¹ For example, the German authorities have recommended a global ban

for the sake of patient safety.²² Although not legally binding, hospital managers have a strong incentive to adhere to this guidance so as to avoid potential litigation. In this study, France is the only country that has actually legislated to ban the use of mobile phones in hospitals. It is not clear at present whether it is planned to review the situation in either country.

Norway, Finland and Sweden had also initially banned the use of mobile phones in hospitals, although more recently hospital managers and local authorities have begun to relax this policy, limiting bans to sensitive areas such as intensive care units and operating theatres. In Norway, the Rikshospitalet University Hospital abandoned its ban in 2000 when mobile phones were used safely as a temporary substitute for a landline system after the hospital had moved into new buildings.²³ These findings were subsequently confirmed by a study by the University of Oslo.¹⁴ In Finland, within the last 2 or 3 years most major hospitals have lifted the ban on mobile phones in certain areas following research undertaken in a Finish hospital.⁶ Also, in Finland the first wireless hospital is currently being developed, reflecting the rapid development of new technologies that substitute traditional fixed-line networks and the use of cables with patient-monitoring equipment.²⁴

In the Netherlands, some hospital managers still prohibit the use of mobile phones in hospitals, although there are no national regulations. Others have begun to allow mobile phones in some areas. Some hospitals even use this policy as part of their online marketing. Here the argument is changing. Where it was once considered dangerous to use mobile phones in hospitals, it is increasingly seen as 'socially undesirable' to expose health care personnel and patients to the noise that often accompanies the use of mobile phones. A similar view is being expressed in Norway.

In contrast, Italy never introduced a complete ban on mobile phones in hospitals. Regulations have only recently been issued to restrict their use in areas in which sensitive devices are used. However, this regulation has not been implemented consistently.

Conclusion

The delivery of clinical care in industrialized countries is increasingly based on evidence of effectiveness. This cannot, however, be said for many of the non-clinical policies in place in health care facilities. These policies impact substantially on the quality of life of patients and staff. For example, even when alternative telephones are provided, patients may not be able to telephone relatives overseas, a matter of increasing importance because of greater international travel

and migration. Yet these policies are often determined primarily by custom and practice rather than by any explicit assessment of the available evidence. Although the safety of mobile phones is a complex issue and one that has been evolving as technology changes, the most recent evidence seems fairly clear. There is no significant danger from using mobile phones as long as they are >1 m from sensitive equipment, and with the most modern equipment, the safety margin is much greater, with phones safe up to 30 cm from equipment. It is also apparent that those working in hospitals do use mobile phones, in contravention of the official policies. When surveyed, physicians believe that mobile phones bring benefits from reduced communication problems.³ Also, wireless technology is rapidly developing and this is likely to have a major impact on hospital equipment (e.g. wireless monitoring of patients), communication networks and hospital data systems.⁶

This small study indicates that, in some countries, the situation is changing, and hospitals are adopting a more relaxed attitude to the use of mobile phones, especially in the Nordic countries and in the Netherlands. These changes seem to be slower in the United Kingdom, perhaps because of the major financial incentives to ensure the viability of the lucrative commercial contracts with telecommunications suppliers that would be threatened if patients could use their own mobile phones.²⁵ However, the nature of the debate is also changing in some countries, with a move away from a position based on considerations of safety to one where mobile phone use is discouraged because of the potential to disturb others. It does, however, seem that, in practice, these issues are often confused.

Public health professionals have played an important role in ensuring that the clinical aspects of health care are more soundly based on evidence than in the past. Surely a basis in evidence is equally important for the non-clinical aspects, many of which are also seen by staff and patients as being important to them.

Acknowledgements

S.E. was funded by a Department of Health grant 'An on-call Facility for International Healthcare Comparisons'. E.N. was supported by a Department of Health Career Scientist Award. However, the Department of Health cannot accept any responsibility for the views expressed.

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