MEDINFO 2007
HISA Ltd Australia
© 2007 The authors. All rights reserved.

The Mobile Phone and Health – Results from a Literature Survey

Günter Schreier

Austrian Research Centers GmbH – ARC, Biomedical Engineering, eHealth systems, Graz, Austria

Abstract

Due to its ubiquitous availability and rapid technological advancement the mobile phone (MP) has been considered and evaluated for many applications beneficial to health. On the other hand, MP use has raised concerns related to possible adverse health effects like interference with and exposure to electromagnetic fields or distraction during driving. The aim of the present study has been to elucidate and quantify the relationship between research on potentially beneficial and adverse effects of MPs on health by means of a literature survey. Results show that relevant publications increased steadily since the 1990's, initially dealing mostly with potentially adverse effects. Publications on beneficial effects started to increase since the late 1990's and amount to approximately 20% of all publications since 2004. Upcoming technologies and still rapidly increasing numbers of MP users are likely to further increase research within the full spectrum of supposedly beneficial and adverse health effects of MP use.

Keywords:

mobile phone, eHealth, telemedicine, health risk

Introduction

Patient empowerment is one of the top priorities among the many hopes and chances the eHealth era is expected to bring for future healthcare [1]. Placing patients in the center of the healthcare system and providing them with tools and knowledge to manage their health and health related data is considered to be essential in facilitating prevention and improving the outcome of treatment.

Due to its ubiquitous availability and rapid technological advancement the MP is poised to be the universal information and communication toolbox for a steadily increasing portion of the worlds population, both in the developed and the developing parts of the world. MPs have, therefore, the potential to serve as a universal eHealth terminal.

As a consequence, MPs have been used and evaluated for health applications by numerous authors. Likewise, we demonstrated the benefits of MP use for the management of patients with chronic diseases [2] and cardiological teleconsultations [3] together with clinical partners.

On the other hand, MP technologies have also raised concerns related to possible adverse health effects. Initial research occurring during the early 1990's assessed health risks in the following categories:

1. distraction during using and handling MPs, e.g. traffic accidents,
2. the impact of electromagnetic fields on medical devices, i.e. electromagnetic interference (EMI),
3. exposure of humans to electromagnetic fields associated with MPs.

A systematic comparison of both, adverse and beneficial effects of MP technology, however, is lacking. The aim of the present study has been to elucidate and quantify the relationship between research on potentially beneficial and potentially adverse effects of MPs on health by means of a literature survey.

Methods

The impact of MPs with respect to health related issues was assessed by querying the PubMed database [4Eysenbach G. What is e-health? J Med Internet Res 2001: 3(2): e20.with the following search phrase:

"(mobile [ti] OR cellular [ti] OR cell [ti]) AND (phone [ti] OR phones [ti] OR telephone [ti] OR telephones [ti])" so as to find any citation containing at least one of the various expressions for "mobile phone" in the title string.

The received citations were classified based on the title and - if necessary and available - the abstract as belonging to one of the following main categories:

1. **Adverse:** article clearly deals with potentially adverse effects of MPs on health
2. **Beneficial:** article clearly deals with potentially beneficial applications of MPs to improve health
3. **Other:** Undefined (title and abstract are inconclusive), Irrelevant (article not specifically associated with health), and Duplicate (article relates to a preceding article which had already been classified)

Results

A total of 814 citations have been obtained and examined (last PubMed access update on Nov. 28th, 2006).

The evolutions of the frequencies of articles over time are depicted as histograms for citations on adverse and beneficial effects in Figure 1 - Annual numbers of citations

dealing with adverse (lower and light part of the bars) and beneficial effects (upper and dark part of the bars) of MPs on health1.

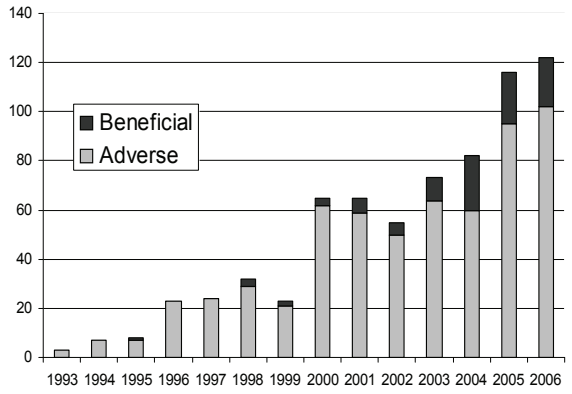

Figure 1 - Annual numbers of citations dealing with adverse (lower and light part of the bars) and beneficial effects (upper and dark part of the bars) of MPs on health

Discussion

Figure 1 - Annual numbers of citations dealing with adverse (lower and light part of the bars) and beneficial effects (upper and dark part of the bars) of MPs on health1 indicates that Publications on the health impact of MPs actually started in the early 1990's and increased in a more or less linear way during the subsequent years. Initially, there were mostly publications on potentially adverse effects. Consistent publication activities on beneficial effects started in the late 1990's, increased until 2003 moderately and leaped to higher levels beginning with 2004. In recent years such publications amount to approximately 20% of all publications considered by this survey.

The presented survey includes only articles listed on PubMed. There are – of course – additional articles dealing with this issue, e.g. articles being associated with the author [3], including articles that would actually have satisfied the search phrase but are not listed on PubMed [5]. Hence, the list is far from being complete and no conclusions can be drawn in terms of absolute numbers.

Since the survey was concluded at the end of November 2006, the numbers for the year 2006 do not yet include December and are therefore underrepresented.

It has to be emphasized that this survey did not attempt to assess details of the outcome of the many articles, neither with respect to adverse nor beneficial effects. Other than a review, this survey did not intend to answer questions like "what is the odds ratio of using MPs with respect to a certain cancer?" or "does MP based home monitoring reduce the frequency of hospital admissions in heart failure patients?". Since for many – in particular older – articles only the title is available on PubMed, a detailed analysis with respect to the outcome would require an additional (probably enormous) effort.

This survey specifically aimed at assessing the interest of the scientific community in all health related effects of MP usage, not only in a particular class or sub-class of effects. To the author's best knowledge such a survey has not yet been performed. This notion is supported by the fact, that in the present sample, no article has been found which covered both, adverse and beneficial aspects of MP use.

Conclusions

Today's MPs provide a large portion of the world's population with an ever more powerful communication tool. With respect to health, MPs were already shown to have both adverse and beneficial aspects – as can be expected from any kind of effective technology. After initial research focused mainly on the risk aspects of MP use, during the last years an increasing number of investigations concentrated on potential benefits.

Upcoming technologies and capabilities and a still rapidly increasing number of MP users will warrant continued and new research within the full spectrum of possible risks and benefits of MP use with respect to health.

References

[1] Eysenbach G. What is e-health? J Med Internet Res 2001: 3(2): e20.

[2] Scherr D, Zweiker R, Kollmann A, Kastner P, Schreier G, Fruhwald FM. Mobile phone-based surveillance of cardiac patients at home. J Telemed Telecare 2006;12(5):255-61.

[3] Kollmann A, Hayn D, García J, Kastner P, Rotman B, Tscheliessnigg KH, Schreier G. Initial experiences with a telemedicine framework for remote pacemaker follow-up. Proceedings of the 28th IEEE EMBS International Conference, New York City, Aug 30-Sept 3, 2006:5218-21.

[4] The National Center for Biotechnology Information, National Library of Medicine, National Institutes of Health, Bethesda, MD, http://www.ncbi.nlm.nih.gov.

[5] Schreier G, Kollmann A, Kramer M, Messmer J, Hochgatterer A, Kastner P. Mobile phone based user interface concept for health data acquisition at home. In: Miesenberger K, Klaus J, Zagler W, eds. Lecture Notes in Computer Science. Springer-Verlag, Heidelberg, 2004; pp. 29-36.

Address for correspondence

Guenter SCHREIER, PhD
Reininghausstrasse 13
A-8020 Graz
P: +43 316 586570-11
F: +43 316 586570-12
E: guenter.schreier@arcs.ac.at