Near Field Communication Technology based mHealth for Telemonitoring of Patients with Chronic Diseases

Günter Schreier, Senior Member, IEEE, Jürgen Morak, Student Member, IEEE, and Peter Kastner

Abstract— mHealth concepts enable patients suffering from chronic diseases to keep in touch with the healthcare system anywhere and anytime. Mobile phone based patient terminals require an easy-to-use and versatile design to facilitate collecting of various kinds of data relevant for therapy optimization. To meet these requirements a user interface concept based on mobile phones and medical sensor devices enabled with Near Field Communication (NFC) technology was developed, linked to a web-based telemonitoring system and evaluated in clinical field trials with patients suffering from different chronic diseases like diabetes and heart failure. The results indicate that NFC based mHealth architectures facilitate intuitive, secure and reliable telemonitoring solutions, even for elderly and technically unskilled patients.

I. BACKGROUND

Near Field Communication (NFC) is a wireless interface increasingly available in current and future mobile phones and smartphones. It is a short range (<10cm) wireless technology evolving from radio frequency identification (RFID) [1]. NFC is well positioned to support any activity of users that can be mapped to a “tap and go” paradigm, e.g. where users need to “touch” items in their environment to initiate and perform a brief communication with this item, for example to read out sensor data. NFC is, therefore, one of the enablers of the “Internet of Things” [2].

II. RESULTS

During the last couple of years we utilized NFC in a number of projects to empower mHealth-based systems in support of chronically ill patients [3]. Table 1 provides key features of selected projects that shared common characteristics, i.e. they were based on telemonitoring systems with web-based access for doctors and NFC-enabled mobile phone based patient terminals and sensor devices.

The obtained results indicate that NFC based mHealth architectures facilitate intuitive, secure and reliable telemonitoring solutions for

- different patient groups, including elderly and technically unskilled patients
- different chronic conditions like Diabetes and Heart Diseases and the collection of
- different kinds of health related information like biosignals, data from medical sensors device, symptom dialogues and data on medication intake

TABLE I. EVALUATION PROJECTS - OVERVIEW

<table>
<thead>
<tr>
<th>Ref</th>
<th>Main Project characteristics</th>
<th>Patient group</th>
<th>Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>[4]</td>
<td>Feasibility of telemonitoring to avoid re-hospitalisation using NFC-based device interfaces (blood pressure devices, weight scales) and iconized symptom dialogue</td>
<td>Phase I: 30 patients (14 f, median 51, IQR [45 - 65] years). Phase II: 15 patients (4 f, median 74, IQR [71 - 83] years)</td>
<td>Heart Failure, Pulmonary Hypertension</td>
</tr>
<tr>
<td>[5]</td>
<td>Medication adherence measurement with NFC enabled eBlisters</td>
<td>59 patients (27 f, 70 ± 5 years)</td>
<td>Type 2 Diabetes, Hyper-tension, Hypercholesterolemia</td>
</tr>
<tr>
<td>[6]</td>
<td>Feasibility of ECG self recording and transmission, including NFC-based Bluetooth device pairing</td>
<td>21 patients (4 f, 54 ± 14 years)</td>
<td>Heart Failure</td>
</tr>
<tr>
<td>[7]</td>
<td>Web versus App+NFC based data acquisition - comparing patient compliance</td>
<td>403 patients, (62 females, 57 ± 11 years)</td>
<td>Diabetes, type 1 and 2</td>
</tr>
</tbody>
</table>

III. CONCLUSION

mHealth in general and NFC based concepts in particular thus are poised to contribute to the concepts of individualized and pervasive healthcare in the sense of anywhere, anytime, including anything for anyone.

REFERENCES


G. Schreier, J. Morak and P. Kastner are with the AIT Austrian Institute of Technology, 8020 Graz, Austria (phone: +43-50550-2960; fax: +43-50550-2950; e-mail: Guenter.Schreier@ait.ac.at).