Health Informatics Meets eHealth
G. Schreier and D. Hayn (Eds.)

doi:10.3233/978-1-61499-858-7-322

Is Austria Ready for Telemonitoring? A Readiness Assessment Among Doctors and Patients in the Field of Diabetes

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Abstract. Background: Telemonitoring offers new opportunities in the treatment of chronically ill patients and could help to improve their quality of life while reducing healthcare costs. Objectives: The willingness to use telemonitoring is examined for both physicians and patients. From the perspective of the most important stakeholders, advantages and disadvantages as well as barriers for telemonitoring are analysed. Methods: A Telehealth Readiness Assessment was carried out with physicians (n=41) and patients (n=47) in a cross-sectional study. A stakeholder survey was conducted by use of interviews (n=28). Results: Average readiness for telemonitoring is 58% for physicians, and 65% for patients. Both are thus in a position where there are several arguments which adversely affect the success of telemonitoring. The most important advantage is the intensified care, while the biggest concerns are data protection as well as the loss of personal communication. The greatest barriers are the lack of funding, the weak clinical and economic evidence and the organisation of the Austrian healthcare system. Conclusion: There are still some barriers to overcome, especially financial, political and organisational.

Keywords. Telemedicine, Managed Care Programs, Austria, Diabetes Mellitus, Surveys and Questionnaires, Attitude of Health Personnel.

1. Introduction

Whether the efforts of research and industry in the field of telemonitoring in recent years have paid off and will now be a success in real life, depends essentially on two questions. Are patients willing to regularly use the sensors and transmit the data? And are doctors ready to evaluate this data and incorporate it into their clinical decisions?

Telemonitoring is the telemedical monitoring of patients who are chronically ill or prematurely released from inpatient treatment in their home environment. In October 2016, a search for "telemonitoring" in the medical literature database PubMed yielded 989 results. Although positive effects of telemonitoring have been demonstrated in several studies, e.g. in [1], there are also those that do not find any significant benefits, such as in [2-5]. However, the American healthcare community seems confident about

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the merits of telehealth solutions, with one out of two clinics in the US already offering telemonitoring [6].

In principle, the Austrian healthcare environment should also be well prepared for using telemonitoring. Smartphones and Internet access are available for almost everybody [7], the IT skills of the population, including the elderly, are getting better [8]. The number of "digital natives" and "digital immigrants" will naturally increase steadily over the next few years, while the number of "digital outsiders" will continue to decline. In general, the acceptance of modern technologies in the healthcare sector is becoming ever higher, as a survey by Bitkom in Germany [9] makes clear: a total of 6 out of 10 German citizens are open to telemonitoring. Already one third could even imagine using skin-implanted microchips to monitor body function. So why is telemonitoring not yet available in Austria's standard care?

The Austrian healthcare system relies on evidence-based medicine. Several authors identified a need for further studies to determine whether telemonitoring can really improve the quality of life while reducing healthcare costs [3,4,10]. In general, the implementation of telehealth among general practitioners in Europe is not very advanced, with 1.4 out of 4 achievable points, as shown by a survey of the European Commission in 2013 [11].

Indeed, the concept of telemonitoring is not well-known among Austrian patients and physicians, with only 10.5% feeling well or very well informed [12]. However, the participating persons, especially the physicians, are an important part of a successful telemonitoring system [13]. Doctors should therefore be included in the planning of telemedical services [14].

In the present study, we thus aimed at identifying the readiness to use telemonitoring specifically among diabetes patients and physicians treating diabetes patients. We chose diabetes as there is scientific evidence that telemonitoring could be especially useful for this highly prevalent disease [2]. Furthermore, we examined the perceived advantages and disadvantages of telemonitoring as well as possibly existing barriers for the Austrian healthcare system.

2. Methods

Two different methods were chosen for this study. For the question of whether Austrian patients diagnosed with diabetes and the doctors involved in the treatment are ready for telemonitoring, a cross-sectional study by questionnaire was carried out (Readiness Assessment). For the qualitative aspects of the questioning, such as advantages and disadvantages as well as barriers, an expert survey among stakeholders was conducted by use of interviews, as well as various open questions added to the questionnaire of the cross-sectional study.

The survey protocol was approved by the ethical committee of the Medical University of Vienna, Austria, (No. 1197/2017) and conducted following the guidelines of the Declaration of Helsinki.

2.1. Readiness Assessment

2.1.1. Study design

We carried out a cross-sectional study among Austrian diabetes patients and practitioners involved in the treatment. We applied a questionnaire-based scoring system to determine whether the participant was ready for telemonitoring or not [15]. Colloquial the term readiness could be understood as a combination of dissatisfaction with status quo (core readiness), motivation to use telemonitoring to improve the current situation (engagement readiness) and the available resources to accomplish this (structural readiness). The questions were designed in a way that full agreement (4 points) indicated high readiness. The total points scored over all questions indicated whether the participants were in a good position (more than 70% of maximum achievable points), experienced several hindering factors (50% to 70%) or even barriers to use telemonitoring (less than 50%). The assessment tool is designed to be modified in order to meet the country-specific health systems environment. In our study, we slightly adapted the tool. First, we did not offer the option "other" and second, we used a four-point Likert scale, not the original five-point one. The questionnaires were translated from English to German. The German questionnaire is available on request from the authors. We pilot-tested the survey with five laypersons and five researchers experienced in questionnaire design. The data from these tests were not included in the final data analyses. The questionnaire was adapted according to the received feedback.

The online study was open and accessible for practitioners from March 6 to June 2 2017 (89 days) and from April 10 to June 30 2017 (82 days) for patients. We used SoSci Survey (www.soscisurvey.de) as a free, electronic web-based survey tool. The software avoided missing answers, so only complete questionnaires without missing values were available. The survey included a cover letter to inform participants about the scope of the survey and use of the collected data. Since participation was voluntary, consent was implicitly obtained by completing the questionnaire. Once a participant completed the survey, an electronic cookie prevented multiple submissions from the same computer. All responses were anonymous. Data were stored securely and were protected from unauthorized access. We did not offer any incentives for participation.

2.1.2. Study sample and data collection for practitioners

We used a nonrandom purposive sample of German-speaking healthcare experts working in one of the nine Austrian federal states. Private and panel doctors who treat diabetes, mainly general practitioners and internists specializing in endocrinology, were eligible for participation. We identified possible participants through professional networks and associations. Potential participants were recruited based on online email address lists available from national healthcare agencies and the Austrian Diabetes Society which initially invited 863 practitioners. We also contacted representatives of relevant organizations and networks to distribute the survey within their organizations. We sent personalized email invitations containing a link to the questionnaire to these experts as well as reminder emails two and four weeks after the initial contact to prompt further completions. Participants were asked to complete the survey and also forward the survey link to eligible colleagues.

2.1.3. Study sample and data collection for patients

We used a nonrandom purposive sample of German-speaking diabetes patients living in one of the nine Austrian federal states. Potential participants were recruited via various online platforms on which the invitation letter, as well as a link to the questionnaire were included. These platforms were the homepages www.diabetes-austria.com (Diabetes Austria), www.diabetes.or.at (ÖDV), the respective official Facebook pages of both organizations (5072 and 1104 likes), as well as the Facebook Page of "Medtronic Diabetes Austria" (2232 likes). In addition, the invitation was posted to the Facebook groups "Diabetes Type 1 Austria" (1260 members) and "Diabetes Type 2 Austria" (180 members). The Facebook group "Diabetes Kids Austria" (531 members) was not considered, as minors as well as parents of children suffering from diabetes were excluded from study participation.

2.2. Expert Interviews

2.2.1. Study Design

The expert interviews were conducted as direct individual interviews with partially standardized questions (guideline-oriented) and open answers. The interview was recorded, transcribed, anonymised and subsequently evaluated using methods of qualitative content analysis. The participants have been informed immediately prior to the interview about the planned recording, anonymization and retention of the data. Patients gave their consent by accepting the "Participant Information", other stakeholders did so verbally ("Verbal Consent"). The original data of the study was only accessible to the study team.

2.2.2. Study sample and data collection

An initial stakeholder analysis identified potential interview partners. The participating stakeholders were selected randomly or on the basis of personal contacts from the population (network effects). The stakeholders were personally contacted and invited to participate in the interview. In total, 44 individuals or organizations were contacted, whereupon 28 appointments were actually made (participation rate: 64%). Experts were representatives of associations, health politics, existing telemonitoring projects (e.g. “Gesundheitsdialog Diabetes”), research and development, industry and of course users (doctors and patients).

2.3. Statistical analysis

For the questionnaire data, we performed descriptive statistical analyses and present categorical data as absolute frequencies and percentages and continuous data as mean, standard deviation (SD), minimum, maximum and median, where appropriate. We calculated the Spearman correlation coefficient between the metric variable readiness and the ordinal variable attendance. We conducted all statistical analyses using SAS (Copyright © 2017 SAS Institute Inc. Cary, NC, USA).

The interviews were first transcribed and then evaluated by content-structuring qualitative content analysis [16]. MAXQDA11 (VERBI GmbH) was used as QDA software and f4 (dr. dresing & pehl GmbH) as transcription software.

3. Results

3.1. Readiness among practitioners

The first page of the questionnaire was opened 60 times, which corresponds to a response rate of 6.95% regarding the practitioners reached through the available mailing lists. The questionnaire was completed 41 times (response rate with completed questionnaire: 4.75%), which took in average 6:00 minutes (range 2:39 to 10:09 min). The participating practitioners were representative of the Austrian medical profession in terms of age, gender, and federal state. The average age was 51.4 years (md=54, SD 9.4, 30 to 72 years), 56.1% were male.

Participants were predominantly internists (73.2%), while only 12.2% were general practitioners. Above average 51.2% of respondents were private practitioners, 19.5% had a contract with a health insurance institution and 22% worked in a hospital. Further 31.7% of practitioners participated in the nationwide disease management program *"Therapie Aktiv"*. The practitioners think mostly positive about telemonitoring (61%) and were generally open to innovations (65.9% perceived themselves as Innovators or Early Adopters).

The readiness of doctors for telemonitoring was in average 58.2% (95% CI: 53.9 - 62.5). This score thus indicates an average readiness situated in the category between 50% and 70%, according to which several arguments have an unfavorable influence on the use of telemonitoring by practitioners. Moreover 19.5% were in a good position, while 31.7% experienced barriers to use telemonitoring. No significant correlations between readiness for telemonitoring and the demographic characteristics of age, sex or medical specialization were detected.

As shown in table 1 structural readiness is much lower than readiness to participate (engagement readiness) and dissatisfaction with the health system (core readiness). 70.8% of the practitioners are more inclined, 29.3% would definitely offer telemonitoring for their patients (attendance). The Spearman correlation coefficient between readiness and attendance is 0.72.

3.2. Readiness among diabetes patients

The first page of the questionnaire was opened 73 times and the questionnaire was completed 48 times. One data set was excluded from the analysis because the participant did not have diabetes, so that 47 questionnaires were used for the analysis. The full answering took in average 8:33 minutes (range 4:45 to 14:20 min).

The average age was 44.2 years (md=42, SD 15.5, 18 to 77 years), 57.4% of the participants were male. The participating patients were representative of the Austrian population in terms of federal state. The most evident difference of this study population in contrast to all diabetes patients in Austria is the distribution of type 1 diabetics (T1D) and type 2 diabetics (T2D). While in the total population only about 10% are T1D, their portion was 61.7% in our study population. From the 34.1% of T2D, 62.5% were insulin dependent. Some people lived with diabetes for many years (max. 45), but most of them between 0 and 10 years (30%). Diabetes was stable with 59.6%, unstable with 6.4%, and alternating with 31.9%. Self-control was documented electronically by 70.2% of respondents, with only 19.1% still using a paper diary. The patients surveyed think mostly positive about telemonitoring (61.7%) and were generally open to innovations (55.3% perceived themselves as Innovators or Early Adopters).

Table 1. Readiness Assessment among practitioners and patients, showing the absolute achieved points for the three categories. The numbers behind the category names indicate the maximum reachable points in this category (practitioners - patients).

	Practitioners (n=41)					Patients (n=47)				
Category	**Mean**	**SD**	**Median**	**Min**	**Max**	**Mean**	**SD**	**Median**	**Min**	**Max**
Core Readiness (12-20)	8.1	1.8	8	3	12	10.1	3.7	10	5	17
Engagement readiness (28-28)	18.4	4.8	18	8	28	22.9	3.5	24	11	28
Structural readiness (28-20)	13.1	4.4	13	7	24	10.9	2.8	11	6	19
Total (68-68)	39.6	9.1	38	26	60	44	5.1	45	30	53

Patient readiness for telemonitoring averaged 64.6% (95% CI: 62.4 - 66.9). This score thus indicates an average readiness situated in the category between 50% and 70%, according to which several arguments have an unfavorable influence on the use of telemonitoring by patients. Moreover 27.3% were in a good position, while 4.3% experienced barriers to use telemonitoring. No significant correlations between readiness for telemonitoring and the demographic characteristics of age, sex or education were detected.

As shown in table 1, structural readiness and dissatisfaction with the health system (core readiness) are much lower than willingness to participate (engagement readiness). Overall 83% of the patients are more inclined to telemonitoring, 44.7% would definitely attend. The Spearman correlation coefficient between readiness and attendance is 0.43.

3.3. Advantages, disadvantages and barriers

Between February and June 2017, 28 interviews were conducted. The conversations lasted in average 34 minutes (range 12 to 76 min). In total, 116 individuals could be reached in the study.

The most mentioned advantage for telemonitoring was the intensification of care provided by this type of treatment. This was mentioned a total of 40 times, 8 times in expert interviews, 18 times in the questionnaire for patients and 14 times in the questionnaire for doctors (40 | 8/18/14). The second most important advantage was the potential shortening of travel and waiting times (21 | 7/8/6). In the questionnaire for patients we asked how long the consultation with the doctor (on average 18 minutes) and how long the doctor's appointment, including the journey and waiting time, lasted (on average 129 minutes). Through the online processing of a consultation, an average of 111 minutes per appointment could be saved. The third most important advantage, according to respondents, was a better therapy adjustment (21 | 7/7/7).

The three main disadvantages were concerns about data protection (21 | 3/13/5), loss of personal communication and over-emphasis on blood glucose levels (15 | 0/6/9). It is also feared that while telemonitoring will be a huge effort for doctors, the benefits will more likely be on the patient side (8 | 2/0/6).

According to the interviews, the most important barrier in the Austrian healthcare system was the lack of funding (15 times), followed by the lack of high quality long term clinical trials for decision-makers and uncertain economic benefits (11 times). Several stakeholders have therefore emphasized that it is important to establish telemonitoring as part of a structured disease management program, like in HerzMobil Tirol [17]. In seven interviews, the absence of telemonitoring in standard care was attributed to the

organization of the Austrian health system itself. Particularly in the field of diabetes, treatment takes place both in the predominantly federal state financed hospitals and in the health insurance funded outpatient sector. Integrated care therefore requires a combination of inpatient and outpatient areas. Apart from the fact that decision-making in the highly fragmented healthcare system is already difficult, it comes in the case of telemonitoring to incur expenses in the outpatient area (through more intensive care by the resident physician), but to a cost reduction in the inpatient area (by less serious late effects, such as foot amputations). This leads to a shift in funding and political power relations, making decisions even more complicated.

4. Discussion

We used an auto-perception questionnaire that focused on personal experience that could vary depending on the individual. The methodology was slightly adapted, e.g. it was unclear how the question "other" should be formulated. After consultation with the original authors of the study, it was decided to delete the question "Other", as these questions were never answered in the original study. In addition, the five-part Likert scale was replaced by a four-part to avoid neutral answers that are difficult to interpret.

The methodology of the Readiness Assessment for physicians and patients provided quite plausible and new results, although the sample is rather small, especially for the patients and very distorted by the high number of T1D, which was caused by the available channels to reach diabetes patients online. The fact that apparently more T1Ds deal intensively with their illness and also inform themselves and exchange information online is a plausible indication that this group is particularly well suited for telemonitoring (technical affinity and disease awareness). Overall, while the study population is not representative of all Austrian doctors and patients in the field of diabetes, it may be similar to the potential target group for telemonitoring.

The answers to the individual questions of the Readiness Assessment were easy to explain, as well as the scores achieved in the respective categories. When comparing the received readiness level of respondents with the answer to the question whether they would attend telemonitoring, it becomes obvious that, as expected, those with higher level of readiness were more likely to attend. The high correlations between readiness and attendance for both physicians and patients suggest that our methodological approach provided plausible results for telemonitoring readiness among Austrian diabetes patients and the doctors involved in treatment.

One of the strengths of this study is the multi-method approach applied and the in-depth view of the topic, which could be achieved through the many interviews with stakeholders from different fields. Due to the relatively open questions and the focus on the type of stakeholder, it was attempted to obtain a very comprehensive picture of the topic. Thus, for example, if a point polled 40 times, it does not mean that this point is irrelevant to the remaining 76 people. Rather, it means that it was a particularly relevant issue with these 40 people. Several concrete barriers have been identified and there were many interesting requirements, wishes and ideas for a successful implementation. We are currently working on further publications dealing with these aspects in detail, while we focused on the Readiness Assessment in this article.

Although patients have a slightly higher readiness for using telemonitoring than doctors, both are in a position where there are several arguments which adversely affect the success of telemonitoring in Austria. This is inline with the results from expert

interviews, finding that there are still some barriers to overcome, especially financial, political, organisational and technical.

The authors are grateful to the participants of the pretest for their helpful and valuable detailed comments and suggestions. The authors also express their sincere appreciation to all survey participants.

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