

Evaluation of Health-related Internet Use in Germany

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Summary

Objective: An eHealth survey was conducted in a major Bavarian region in order to evaluate health-related Internet use in Germany.

Methods: A specific questionnaire was developed by the authors to collect sociodemographic data as well as data on general and health-related Internet use. This questionnaire was distributed to patients visiting medical practices in the above mentioned Bavarian region.

Results: Whereas many Internet users look for health-related information and products on the Internet, more advanced web-based techniques such as chat rooms and electronic patient records are hardly used.

Conclusions: Although modern information technologies have the potential to enable citizens to handle their own health-related information in a self-determined and informed manner, at present the general population in Germany is hardly taking this opportunity.

Keywords

eHealth, evaluation, Internet

Methods Inf Med 2006; 45: 367–76

1. Introduction

Representative surveys about Internet use in Germany have been conducted by poll agencies for several years now [1]. In Germany Internet use has been increasing steadily. In 2004 52.7% of the German population had been online and a further 6.6% were planning to use the Internet within the next twelve months [1]. The Internet has become an increasingly important medium for information and communication for all sociodemographic groups [1]. As it is politically intended to promote the global information society in Europe, Internet use will still be spread further; a possible digital divide will be counteracted by political as well as non-political efforts especially addressing those who are less interested in the Internet [2, 3].

Among a huge amount of heterogeneous services the Internet also contains many health-related offers. Health-related information and products are widely available by a variety of web-based technologies [4-11]. eHealth addresses the general population as well as health professionals and ranges from text-based information to sophisticated tools with a multitude of progressive functionalities [4-11]. Offered in heterogeneous quality by diverse institutions, many offers are free of charge, while others are commercially available. According to current political intentions of the European Union and its member states eHealth will gain more and more importance [2, 3].

International evaluation studies are increasingly focusing on specific aspects of eHealth [12-27]. Attitudes to and actual use of diverse health-related Internet services by the German population have so far hardly been studied and are largely unknown. The Eurobarometer 2003 as well as a survey conducted by TNS Emnid, a German poll agency, found that one fourth of the German

population uses the Internet as a source of health-related information [28, 29]. The survey presented in this paper focuses more specifically on the use of the Internet for health-related purposes by the general population in Germany.

The results of this survey are presented. Factors influencing the evaluation results are discussed and recommendations for improving the general population's acceptance of eHealth services are made.

2. Objectives

The overall goal of the study was to evaluate health-related Internet use in Germany. More specifically the following major questions were to be answered:

- 1) How important does the population rate diverse factors for assessing health-related websites?
- 2) Which percentage of the population already uses the Internet to search for health-related information or products?
- 3) Are Internet forums, self-help groups and/or chat rooms already an important means in health-related matters?
- 4) Which percentage of the population is using Web-based applications to manage their own health-related information?
- 5) Which percentage of the population is using the Internet to access their electronic patient record (EPR)?

3. Material and Methods

3.1 Questionnaire

For evaluating health-related Internet use, a questionnaire (Fig. 1) of two A4 pages in length was developed by eHealth education

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Bitte geben Sie diesen Fragebogen in einer Apotheke
oder einer Arztpraxis des GOIN ab oder schicken/
faxen Sie ihn an die nebenstehend angegebene Adresse.

Fragebogen zur Internet-Nutzung in Gesundheitsfragen
(Um den Fragebogen auszufüllen, sollten Sie 18 Jahre oder älter sein.)

I. ALLGEMEINE ANGABEN *Einfachauswahl*

1. Geschlecht männlich weiblich

2. Alter 18-30 31-45 46-60 61-70 > 70 J.

3. Bildungsabschluss keiner Hauptschulabschluss/Reife/Quali Mittlere Schulabschluss Hochschulabschluss sonstiger *genaue Angabe*

4. Höhe des monatlichen Haushaltsnettoeinkommens
 < 1.000 € 1.000 bis unter 1.500 € 1.500 bis unter 2.000 €
 2.000 bis unter 2.500 € 2.500 bis unter 3.000 € ≥ 3.000 €

5. Waren Sie oder ein Familienmitglied in den letzten 5 Jahren schwer krank?
 falls ja, wie war der Verlauf? *Mehrfachauswahl* ja nein
 akut chronisch (z.B. Diabetes)

6. Nutzen Sie das Internet? ja nein *Falls nein, gehen Sie zu Block II.*

7. Wie oft nutzen Sie das Internet? seltener als monatlich monatlich wöchentlich täglich

8. Wo nutzen Sie das Internet? *Mehrfachauswahl*
 am Arbeitsplatz zu Hause bei Freunden, Bekannten oder einem Familienmitglied
 in einer öff. Bibliothek im Internetcafé sonstiges *genaue Angabe*

II. ELEKTRONISCHE GESUNDHEITSKARTE *Einfachauswahl*

1. Haben Sie von der elektronischen Gesundheitskarte gehört?
 falls ja, wissen Sie, was die elektronische Gesundheitskarte ist? ja nein

2. Haben Sie von dem elektronischen Rezept gehört?
 falls ja, wissen Sie, was das elektronische Rezept ist? ja nein

Falls Sie das Internet nicht nutzen, enden Sie hier. Vielen Dank!

III. INTERNET-NUTZUNG IN GESUNDHEITSFRAGEN *Einfachauswahl*

1. Wie wichtig sind für Sie die folgenden Faktoren bei der Bewertung einer Gesundheits-Website?
Geben Sie jedem Faktor einen Wert von 1 'sehr wichtig' bis 5 'unwichtig'

muttersprachliche Information	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
leicht verständliche Information	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
aktuelle Information	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
von medizinischen Experten verliehenes Qualitätssiegel	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Datenschutz und -sicherheit	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Interaktivität (z.B. Frage-/Antwort-Möglichkeit)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Informationsvermittlung unter namentlicher Nennung medizinischer Experten	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Nennung des Verantwortlichen der Website	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Nennung des Sponsors der Website	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

Bitte wenden.

2. Haben Sie im Internet Informationen zu Gesundheitsthemen/Krankheiten gesucht? ja nein

2.a falls ja: wie oft? seltener als monatlich monatlich wöchentlich täglich
warum? Mehrfachauswahl
 um sich allgemein zu Gesundheitsthemen/Krankheiten zu informieren
 um sich zu speziellen Themen, die Sie mit Ihrem Arzt besprochen hatten, zu informieren
 um das Zutreffen einer ärztlichen Aussage zu überprüfen
 sonstiges *genaue Angabe*

2.b falls nein: warum nicht? *Mehrfachauswahl*
 kein Informationsbedarf
 Ich wusste nicht, dass ich dafür das Internet nutzen kann.
 Zweifel an der Qualität der Information
 sonstiges *genaue Angabe*

3. Haben Sie im Internet nach gesunderhaltenden Produkten, Heil- und Hilfsmitteln gesucht? ja nein

3.a falls ja: wie oft? seltener als monatlich monatlich wöchentlich täglich

3.b falls nein: warum nicht? *Mehrfachauswahl*
 kein Bedarf an derartigen Produkten
 Ich wusste nicht, dass ich dafür das Internet nutzen kann.
 Zweifel an der Qualität der angebotenen Produkte
 sonstiges *genaue Angabe*

4. Haben Sie sich per Internet mit anderen über Gesundheitsthemen/Krankheiten unterhalten? ja nein

4.a falls ja: wie oft? seltener als monatlich monatlich wöchentlich täglich
wie? Mehrfachauswahl
 im Chat (Online-Unterhaltung)
 in Foren/Selbsthilfegruppen (interaktive Plattformen zur Diskussion bestimmter Themen)
 sonstiges *genaue Angabe*

4.b falls nein: warum nicht? *Mehrfachauswahl*
 kein Bedarf an einer derartigen Diskussion oder Unterhaltung
 Ich wusste nicht, dass ich dafür das Internet nutzen kann.
 Zweifel am Sinn dieser Gruppen
 sonstiges *genaue Angabe*

5. Verwalten Sie selbst Informationen über Ihre eigene Gesundheit/Krankheit über das Internet? ja nein

5.a falls ja: in welcher Form? *Mehrfachauswahl*
 Homepage kommerzielle Web-Datenbank kommerzielle Web-basierte Gesundheitsakte

5.b falls nein: warum nicht? *Mehrfachauswahl*
 kein Interesse
 Ich wusste nicht, dass ich dafür das Internet nutzen kann.
 Zweifel am Sinn einer solchen Datenablage
 Zweifel an Datenschutz und -sicherheit
 sonstiges *genaue Angabe*

6. Greifen Sie über das Internet auf eigene Krankheitsinformationen zu, die von einer medizinischen Einrichtung in einer elektronischen Patientenakte verwaltet werden? ja nein

6.a falls ja: wer stellt diese elektronische Patientenakte zur Verfügung? *Mehrfachauswahl*
 eine Arztpraxis ein Krankenhaus sonstige Einrichtung *genaue Angabe*

6.b falls nein: warum nicht? *Mehrfachauswahl*
 kein Interesse
 Ich wusste nicht, dass ich dafür das Internet nutzen kann.
 Zweifel am Sinn einer solchen Datenablage
 Zweifel an Datenschutz und -sicherheit
 keine Gelegenheit
 sonstiges *genaue Angabe*

Vielen Dank!

Bitte geben Sie diesen Fragebogen in einer Apotheke oder einer Arztpraxis des GOIN ab oder schicken/faxen Sie ihn an die oben angegebene Adresse.

Fig. 1 Questionnaire for evaluating health-related Internet use

specialists. The questionnaire is organized into three main sections. The first section contains eight questions to collect sociodemographic data (gender, age, education, net income per household, and severe diseases encountered by the respondent or a family member within the last five years) as well as data on the general use of the Internet (Internet use if at all and frequency and place of access to the Internet). The second section of the questionnaire consists of two questions assessing the awareness of the citizens about the electronic health card and electronic prescription which are expected to be implemented in the near future in Germany. The third section comprises seven questions on health-related Internet use. These questions specifically inquire about the way the respondents assess health-related websites,

look to the Internet for health-related information and products, participate in Internet forums, self-help groups and/or chat rooms about health-related matters, use eHealth applications to manage their own health-related information, and their possible use of the Internet to access their EPR, should they have this facility.

The items of the questionnaire were quality-ensured by taking into consideration commonly acknowledged quality criteria such as a detailed, precise, comprehensible, and standardized formulation of questions and categories [30]. Navigation information was added to the questionnaire in order to indicate single and multiple choice options, rating options, and branching information and furthermore to ask the respondent to precisely specify other information. The

layout was optimized in order to enable easy understanding of the questionnaire.

The questionnaire was validated in three steps and modified accordingly after each validation step. In a first validation step the questionnaire was completed by several test respondents who had not been involved in the project. These persons were observed while filling the questionnaire and asked to comment on their answers. In a second validation step the questionnaire was used in a pilot study with 212 participants. The difficulties and misunderstandings of the respondents concerning the questionnaire were analyzed. Consequently some questions were rephrased and the navigation and layout were improved. Thirdly, the resulting questionnaire was once again filled in by several test respondents and was also re-

viewed by eHealth evaluation specialists who were not involved in the project.

3.2 Study Setting and Design

The survey was conducted between May 5 and June 10, 2005 by the Department of Medical Informatics of the Friedrich-Alexander-University of Erlangen in partnership with the GOIN general office. Hundred questionnaires were sent to each of the 367 medical practices of the Bavarian medical practices' network GOIN. The GOIN network organizes 92% of the general practitioners and 67% of the specialist doctors of the central Bavarian region Ingolstadt/Eichstätt/Pfaffenhofen/Neuburg-Schrobenhausen. This network aims to realize integrated patient care by efficient process management, to provide high quality patient care, to improve communication and cooperation among health professionals by introducing health telematic applications, to perform quality assurance, planning, controlling, and benchmarking, and to manage and certify medical practices. In addition, it is expected to be one of the test regions for the future German electronic health card. The region has 447,891 inhabitants and covers 2848 km².

An accompanying letter by the GOIN general office informed the health professionals of the medical practices about background, scope, and execution of the survey. The medical secretaries were advised to hand the questionnaires to the patients coming in for their medical appointment. Each questionnaire was provided together with a cover letter addressing the respondent and explaining the background and importance of the survey. The patients were instructed to fill in the questionnaire in the doctor's waiting room and then to hand it back at the point of registration of the medical practice. The minimum age for participation in the survey was 18. The medical practices sent back the questionnaires to the GOIN general office by June 10, 2005.

3.3 Data Capture and Analysis

The information from the completed questionnaires was entered in an MS Access

database. Guidelines describing electronic data capture were established beforehand in order to guarantee a standardized and correct procedure. Data quality of the captured data was ensured by verifying the data by a second independent person.

Problem formulation, research questions, and statistical analysis were specifically described. The electronic data were analyzed with the statistics software JMP IN 5.1.2 of JMP, a business unit of SAS. Distributions and Pareto Plots as means of uni- and bivariate statistics were applied to the questions. Thus bar charts, pie charts, mosaic plots and/or tables resulted for each of the questions. Where adequate the questions concerning health-related Internet use were stratified according to the sociodemographic data, the experience of severe diseases, and Internet use. Guidelines describing interpretation of the data were established in order to allow for standardized interpretation.

4. Results

4.1 Execution of the Study

36,700 questionnaires were distributed to the medical practices. 2272 completed questionnaires were returned to the Department of Medical Informatics, which translates into a response rate of 6.2%. Four of the completed questionnaires were excluded either due to their low data quality and missing data or because the respondents stated an age below 18.

The survey was mostly executed as described above. Most questionnaires were completed while waiting at the medical practice and returned during the visit at the medical practice. Some questionnaires were completed after the visit and returned to the medical practice later.

4.2 Sociodemographic Data

Analysis of the sociodemographic data shows 33.9% male and 63.1% female respondents. The age groups are distributed as follows: 20.1% for the age group 18-30,

32.6% for ages 31-45, 21.8% for ages 46-60, 11.6% for ages 61-70 and 7.9% for ages 70 and above. Whereas 5.1% of the respondents had not completed any education, 43.0% of the respondents had accomplished a basic level of education (*Hauptschulabschluss/Quali*) and 37.1% of the respondents achieved a medium level of education (*mittlere Reife/Abitur* or equivalent). 20.4% have a monthly net income <1000 € per household and 19.1% <1500 €, respectively; 11.7%, 11.2%, 12.4%, and 7.9% earn 1500-2000 €, 2000-2500 €, 2500-3000 €, and 3,000 € or above, respectively.

Severe diseases have been experienced within the last five years by one third of the respondents or a family member. Of these respondents 45.8% stated to have experienced one or more acute severe diseases and 49.7% one or more chronic severe diseases.

4.3 Internet Use

The Internet is used by 56.7% of the respondents, 87.7% of these Internet users access the Internet at home, 31.8% at work, 10.2% through friends, relatives or acquaintances, 4.4% from an Internet café, and 2.0% from a public library. The Internet is accessed frequently – daily or weekly – by more than 70% of the Internet users (Table 1).

The Internet users show the same relation of genders and of respondents stating and not stating severe diseases as the sample. Compared to the sample of all respondents the Internet users are younger,

Table 1 Frequency of Internet access by the Internet users

Frequency of Internet access	
Daily	34.5%
Weekly	36.7%
Monthly	14.7%
Less than monthly	10.1%
Not specified	3.2%
Invalid	0.8%
Basis (Internet users)	1285 (100%)
N Missing	0

better educated, and have a higher monthly disposable net income per household.

4.4 Health-related Internet Use

4.4.1 Factors for Assessing Health-related Websites

The Internet users rated nine assessment factors more or less important (Table 2). Information to be easily comprehensible, in mother tongue, and up-to-date as well as data safety and security of health-related websites were judged to be very important by more than 60% and very important or important by more than 80% of the Internet users (Table 2). A quality certificate provided by medical experts is very important or important for 63.9% of the Internet users (Table 2). 46.8-58.1% of Internet users rated interactivity e.g. in the form of question and response, presenting health-related information by citing medical experts, and naming the person who is responsible for a website very important or important (Table 2). Only 22.1% of the Internet users consider it very important or important to name the sponsor of a website (Table 2). A fairly high percentage of 5.2-7.6% of Internet users did not specify any answer to these questions (Table 2).

The frequency of Internet access influences the user's rating of the assessment factors. This becomes obvious when the stratification results are analyzed according

to each of their answer categories and the combined answer categories "very important"/"important" and "less important"/"unimportant" (Table 3). Data safety and security was rated notably more important by those frequently accessing the Internet (Table 3). Information being in mother tongue, easily comprehensible, and up-to-date, citation of medical experts, and naming the person who is responsible for a health-related website are rated more important by those frequently accessing the Internet (Table 3). On the other hand frequency of Internet use does not seem to influence the rating of the importance of quality certificates and interactivity of health-related websites (Table 3). Stating the sponsors of a health-related website was even clearly less important for those frequently accessing the Internet (Table 3). More than 10% of those very rarely accessing the Internet did not rate the nine factors (Table 3).

4.4.2 Health-related Information Search on the Internet

62.3% of the Internet users search for health-related information on the Internet (Table 4). More than two-thirds of these search less than once monthly (Table 5). Approximately two-thirds of those Internet users not searching for health-related information on the Internet claim no need to do so; less than 20% each either did not know that they could use the Internet for such a search or doubt the quality of the information (Table 6).

Whereas equally as many men as women search for health-related information on the Internet (data not shown), clear differences show for the other sociodemographic groupings. Higher age, better education, higher net income per household, statement of severe diseases, and frequent Internet access relate to a notably higher percentage of the Internet users who search for health-related information on the Internet (data not shown).

4.4.3 Health-related Product Search on the Internet

37.0% of the Internet users search for health-related products such as remedies and adjuvants on the Internet (Table 4). More than two-thirds of these search less than once monthly (Table 5). About 60% of those not searching for health-related products on the Internet claim that there is no need for such products, almost 20% doubt the quality of the offered products, and almost 10% did not know that they could use the Internet for such a purpose (Table 6).

Again, analogous percentages of men and women search for health-related products on the Internet (data not shown). A notably higher percentage of the Internet users searching for health-related products on the Internet is found for higher age, better education, higher net income per household, statement of severe diseases, and daily Internet access (data not shown).

Table 2 Importance of assessment factors of health-related websites

Importance of assessment factors	Very important	Important	More or less important	Less important	Unimportant	Not specified	Invalid	Basis (=100%)*
Easily comprehensible information	68.5%	17.1%	5.4%	1.5%	2.0%	5.3%	0.2%	1284
Information in mother tongue	64.9%	16.8%	8.5%	1.2%	3.3%	5.2%	0.0%	1284
Up-to-date information	62.9%	20.2%	6.3%	2.1%	2.2%	5.2%	1.0%	1284
Data safety and security	67.5%	13.0%	8.1%	2.1%	2.9%	5.7%	0.7%	1284
Quality certificate	33.1%	30.8%	19.3%	4.7%	4.7%	6.9%	0.6%	1284
Interactivity	26.2%	31.9%	22.7%	7.8%	3.3%	7.6%	0.4%	1284
Citation of medical experts	24.7%	29.8%	25.0%	8.9%	4.2%	7.1%	0.3%	1284
Responsibility	23.7%	23.1%	25.2%	13.6%	8.3%	6.2%	0.1%	1284
Sponsor	10.5%	11.6%	19.0%	17.0%	35.4%	6.5%	0.1%	1284

* Internet users, N Missing 1

Table 3 Importance of assessment factors of health-related websites by frequency of Internet access

Importance of assessment factors by frequency of Internet access								
Easily comprehensible information								
Frequency	Basis (= 100%)	Very important	Important	More or less important	Less important	Unimportant	Not specified	Invalid
Less than monthly	129	65.1%	14.0%	3.1%	2.3%	4.7%	10.9%	0.0%
Monthly	189	61.9%	22.8%	7.4%	1.6%	2.1%	4.2%	0.0%
Weekly	472	70.3%	16.7%	4.7%	2.1%	1.5%	4.2%	0.4%
Daily	443	70.2%	17.4%	6.1%	0.5%	1.6%	4.3%	0.0%
Information in mother tongue								
Less than monthly	129	65.1%	10.1%	7.8%	0.0%	5.4%	11.6%	0.0%
Monthly	189	60.3%	19.6%	11.1%	2.6%	2.1%	4.2%	0.0%
Weekly	472	68.6%	15.5%	8.9%	0.8%	3.0%	3.2%	0.0%
Daily	443	63.4%	19.9%	7.4%	1.6%	3.4%	4.3%	0.0%
Up-to-date information								
Less than monthly	129	55.8%	18.6%	4.7%	2.3%	3.9%	10.9%	3.9%
Monthly	189	57.7%	23.3%	5.8%	3.7%	2.6%	5.3%	1.6%
Weekly	472	65.3%	20.1%	6.4%	2.1%	1.7%	3.8%	0.6%
Daily	443	65.9%	20.1%	7.0%	1.6%	1.6%	3.6%	0.2%
Data safety and security								
Less than monthly	129	53.5%	16.3%	9.3%	3.1%	6.2%	11.6%	0.0%
Monthly	189	59.3%	18.0%	10.6%	2.1%	3.7%	5.8%	0.5%
Weekly	472	71.0%	11.9%	7.2%	2.3%	2.3%	4.2%	1.1%
Daily	443	71.8%	12.0%	8.1%	1.6%	1.8%	4.1%	0.7%
Quality certificate								
Less than monthly	129	32.6%	31.0%	16.3%	1.6%	3.9%	13.2%	1.6%
Monthly	189	28.6%	30.7%	21.2%	5.3%	6.9%	6.9%	0.5%
Weekly	472	36.0%	31.8%	17.2%	4.2%	4.2%	5.9%	0.6%
Daily	443	32.7%	30.5%	22.6%	5.6%	3.6%	4.7%	0.2%
Interactivity								
Less than monthly	129	25.6%	31.8%	19.4%	7.0%	3.9%	10.9%	1.6%
Monthly	189	18.5%	34.4%	22.8%	14.3%	1.6%	7.4%	1.1%
Weekly	472	28.4%	27.8%	25.2%	7.8%	3.8%	7.0%	0.0%
Daily	443	28.4%	35.0%	21.4%	5.9%	3.2%	5.9%	0.2%
Citation of medical experts								
Less than monthly	129	23.3%	25.6%	26.4%	8.5%	4.7%	11.6%	0.0%
Monthly	189	21.2%	31.7%	24.9%	12.7%	3.7%	5.8%	0.0%
Weekly	472	25.2%	26.7%	29.2%	8.1%	3.6%	6.6%	0.6%
Daily	443	26.9%	33.0%	21.2%	9.0%	4.3%	5.4%	0.2%
Responsibility								
Less than monthly	129	21.7%	18.6%	27.1%	13.2%	7.8%	10.9%	0.8%
Monthly	189	18.5%	20.6%	28.6%	15.9%	11.1%	5.3%	0.0%
Weekly	472	22.9%	25.4%	24.6%	12.5%	9.3%	5.3%	0.0%
Daily	443	27.5%	23.9%	24.8%	13.1%	6.1%	4.5%	0.0%

Table 3 Continued

Frequency	Basis (= 100 %)	Very important	Important	More or less important	Less important	Unimportant	Not specified	Invalid
Sponsor								
Less than monthly	129	10.1%	13.2%	23.3%	15.5%	26.4%	11.6%	0.0%
Monthly	189	9.0%	12.7%	19.6%	18.0%	34.9%	5.8%	0.0%
Weekly	472	11.0%	11.7%	21.2%	17.8%	33.3%	5.1%	0.0%
Daily	443	10.6%	10.8%	15.8%	16.5%	40.9%	5.2%	0.2%

Table 4 Usage of health-related Internet offers

Usage of health-related Internet offers	Yes	No	Not specified	Invalid	Basis (=100%)*
Information	62.3%	33.7%	3.3%	0.7%	1285
Products	37.0%	59.3%	3.4%	0.3%	1285
Communication	10.4%	86.2%	3.2%	0.2%	1285
Management of disease information	4.5%	92.0%	3.4%	0.1%	1285
Access to EPR	4.1%	91.8%	3.8%	0.2%	1285

* Internet users, N Missing 0 Multiple choice

Table 5 Frequency of using health-related Internet offers

Frequency of using health-related Internet offers	Information	Products	Communication
Less than monthly	68.7%	68.8%	47.0%
Monthly	20.4%	19.6%	25.8%
Weekly	7.2%	8.4%	9.9%
Daily	1.5%	2.7%	6.8%
Not specified	2.3%	0.4%	10.6%
Basis (=100%)*	801	475	132

* Internet users using the respective health-related Internet offer, N Missing 0/0/1

4.4.4 Health-related Communication via the Internet

Only 10.4% of the Internet users communicate with others via the Internet about health-related topics (Table 4). More than 70% of these do this monthly or less than monthly (Table 5). More than 70% of those not communicating about health-related topics via the Internet claim no need to do so; 16.4% doubt the usefulness of such communication groups and 7.3% did not know that they could use the Internet for such a purpose (Table 6). Of the sociodemographic factors only a higher net income per household and statement of severe diseases relate

to a higher percentage of Internet users communicating about health-related topics via the Internet (data not shown).

4.4.5 Web-based Management of Personal Health-related Information

Only 4.5% of the Internet users manage personal health-related information via the Internet (Table 4). More than 80% of those do so by a personal homepage. Less than 20% do so either by a commercial web-database or by a commercial web-based health record. More than 50% of those not managing health-related information via the Internet claim they are not interested, 25.5%

doubt data safety and security, 17.3% doubt the usefulness, and 11.1% did not know that they could use the Internet for such a purpose (Table 6). Of the sociodemographic factors, a higher monthly net income per household and the statement of severe diseases relate to more Internet users who manage personal health-related information by web-based technologies (data not shown).

4.4.6 Access to a Medical Institution's EPR

4.1% of the Internet users stated to be using a web-based access to personal disease information managed by a medical institution in an EPR (Table 4). Eighteen of these patient records are provided by a medical practice, 27 by a hospital, and 11 by other medical institutions such as health insurance companies. Almost 40% of those not accessing personal disease information in an EPR claim no interest, 26.8% did not know that they could use the Internet for such a purpose, 23.0% doubt data safety and security, and less than 10% each stated that they doubt an EPR's usefulness or did not have the opportunity to do so (Table 6). The sociodemographic groupings reveal no tendencies (data not shown).

5. Discussion

5.1 Background and Significance of the Survey

In the upcoming information society eHealth is expected to revolutionize traditional health care systems [31]. Health-related Internet services addressing the general population are a part of eHealth. Increasingly inter-

Table 6 Reasons for not using health-related Internet offers

Reasons for not using health-related Internet offers	Information	Products	Communication	Management of health-related information	Access to EPR
No need	65.4%	61.2%	70.6%	–	–
No interest	–	–	–	53.6%	39.8%
Being unaware of this option	19.6%	8.8%	7.3%	11.1%	26.8%
Doubting the quality	13.2%	19.8%	–	–	–
Doubting the usefulness	–	–	16.4%	17.3%	9.8%
Doubting data safety and security	–	–	–	25.5%	23.0%
No opportunity	–	–	–	–	7.6%
Other	3.7%	4.5%	4.3%	2.2%	1.6%
Basis (= 100%) *	433	761	1107	1182	1179

* Internet users not using the respective health-related Internet offer

Multiple choice

national studies explore health-related Internet use [12-27]. Nevertheless, these studies generally focus on specific aspects of eHealth. Surveys extensively investigating the Internet users' attitudes to and their actual use of current health-related Internet services have not yet been published.

5.2 Questionnaire

The questionnaire is an important instrument measuring the information society's realization. The survey shows which kinds of health-related Internet services are already perceived and accepted by the general population. Major obstacles to their use are identified as well as the criteria by which health-related websites are assessed by the general population. Grouping the results of the survey by e.g. gender and age shows which groups of the population perceive the Internet to be an important source of health-related information. Deficits in disseminating the information society and needs of action concerning the population's perception of health-related Internet offers may be recognized. Thus, a possible health-related digital divide may be avoided by including all groups of society.

The questionnaire's quality has been assured by several measures. Objectivity, i.e. independence of the results from those conducting the survey and validity, i.e. measuring exactly what is intended to be measured have been taken into account. Objectivity is guaranteed by the questionnaire being highly

standardized and the study design (execution objectivity), guidelines for data capture and analysis (objectivity of analysis), and interpretation guidelines (interpretation objectivity). The questionnaire's internal validity has been ascertained by involving specialists for evaluation in medical informatics and by considering common quality criteria. The questionnaire's reliability – repeated measurements gain the same results – was not tested due to high extra workload.

As it was intended to survey health-related Internet use in general, questionnaires were the instrument of choice. Conducting the survey by distributing paper-based questionnaires also had the clear advantage of easily and quickly gaining answers from a great number of respondents with a minimum amount of effort. Interviews, as an alternative instrument, would have been much more time-consuming; greater flexibility and detail offered by semi-structured interviews were not needed. Using web-based instead of paper-based questionnaires would have introduced an additional bias.

5.3 Study Setting, Design, and Execution

The region in which the survey has been conducted is not completely representative of the German federal state. It for instance does not include major cities.

The fact that the survey has been conducted in the medical practices of the GOIN

regional network might have influenced the respondents' attitudes, needs, and behavior concerning health-related Internet use as the GOIN is very progressive in terms of quality initiatives related to medical practice and the introduction of information and communication technologies in the public health system [32]. The health professionals' attitudes and behavior might have influenced their patients e.g. by recommending the use of Internet technologies for information and communication or by the usage of modern information and communication technologies in their offices.

Distributing the questionnaires in medical practices gained a convenience sample. Thus, this sample was not representative of the chosen region as confirmed by its sociodemographic structure which differs clearly from that of the basic population of the study region. This is especially obvious for the distribution of the genders [34].

The response rate cannot be exactly determined, since it is unknown how many questionnaires had actually been handed out by the health professionals and returned by the respondents. Not every medical practice distributed all of the provided questionnaires. Several medical practices discarded questionnaires when closing for vacations. Also, medical secretaries felt that handing out the questionnaires and explaining the survey would interfere with their every-day-routine. Patients frequently rejected participation.

Nevertheless, the response rate was determined on the basis of the number of questionnaires distributed to the medical prac-

tices and the number of questionnaires returned to the Department of Medical Informatics. The actual response rate is expected to be much higher. Taking study design and context of the public health system into account the calculated response rate of 6.2% seems to be an average result.

Even though the survey was basically conducted anonymously, perfect anonymity of the respondents was not guaranteed. In the case that health professionals were interested, they could have checked a respondent's answers. This might have prevented patients from participating. On the other hand the sensitive questions about education, income, severe diseases, and the intention of checking a doctor's statement might have been left unanswered to an increased extent. This might explain the high rate of 17% of respondents who did not specify their income.

Due to the chosen distribution method the rate of respondents stating a severe disease might have been greater than when compared to the basic population. This implies an increased percentage of persons who are in need of and interested in health-related information. On the other hand the percentage of socially marginal groups is expected to be greater in medical practices. Only those patients highly motivated to complete a questionnaire about health-related Internet use might have done so.

Nevertheless, this survey is the first thematically extensive survey about health-related Internet use in Germany. Thus, the tendencies described are of greater importance than the exact values. In order to gain a representative picture of health-related Internet use in Germany, two major representative telephone surveys investigating European health consumer's use of, their attitudes to, and their preferences with regards to information and communication technology for health purposes are to be conducted in seven European countries including Germany [33]. It may be expected that the tendencies shown here will be confirmed for the German population.

5.4 Data Quality

The data quality of the received completed questionnaires is very high. Major faults re-

ducing the data quality of the questionnaires were hardly encountered. Only two questionnaires had to be excluded from the analysis due to their low data quality. Most mistakes made by the respondents such as unanswered main questions despite of an answered subordinate question were legitimately compensated according to the guidelines for data capture. The sociodemographic questions about the level of education, monthly net income, and severe diseases were frequently left unanswered.

5.5 Internet Use

The percentage of 56.7% Internet users is only slightly larger when compared to 54.7% in Bavaria in 2004 and 55% in the German federal state in 2005 [1]. The relation of genders is unchanged among the sample's Internet users when compared to the sample. This is surprising, since representative surveys on general Internet use in Germany show that, compared to the basic population, the relation of genders among Internet users is shifted in favor of men [1]. As found in representative surveys on general Internet use compared to the sample or basic population, respectively, Internet users are younger, better educated, and have a higher income [1].

5.6 Health-related Internet Use

5.6.1 Factors for Assessing Health-related Websites

According to the Internet users' rating of the assessment factors it is most important to present medical information as easily comprehensible as possible. This need is stressed by the high relevance attributed by the Internet users to medical information being presented in mother tongue. Today's information flood in general and medicine's complexity specifically require health-related information to be presented as easily comprehensible and precise as possible [35].

Data safety and security of health-related websites being rated second most important shows that the Internet users are highly sensitized to this subject. Of the five assess-

ment factors related to the information's quality only up-to-dateness was rated very important. Quality certificates of health-related websites ranked fifth; presenting medical information by citing medical experts, naming the person who is responsible for a health-related website, and naming the sponsor of a health-related website ranked seventh to ninth with only 50% and 20% of the Internet users respectively thinking these factors very important or important.

Whereas Internet users are highly sensitized to the issue of data safety and security related to the Internet, Internet users obviously are not adequately sensitized to the relevance of quality indicators in relation with medical information. Throughout the years data safety and security has been picked out as a central theme by the media. Quality indicators with respect to information on the other hand are rarely covered. It might even be unclear how to properly evaluate the quality of information. Thus, diverse initiatives such as the European Community Quality Criteria for Health-related Websites and HON are recently defining and spreading the knowledge and use of quality indicators of information [36-38]. It is nevertheless rather surprising that the five quality indicators of information have been rated comparatively unimportant. Yet, more than 60% of the responding Internet users are well or very well educated. Many Internet users might not be aware of the existence of quality certificates for medical information, thus not realizing their importance.

The quality of health information for consumers on the Internet is generally seen to be a problem [39, 40]. Diverse studies have shown that Internet users are generally concerned about the quality of online health information, but often do not pay attention to indicators of credibility [12-14]. Data safety and security have been found to be a major concern of German Internet users in 2005 [1].

Interactivity of health-related websites which offers the advantage of providing individualized information has presently been discovered as being useful by a slight majority of the Internet users. Even though more than 70% of the questioned Internet users stated to access the Internet daily or weekly,

interactivity might be too technically advanced for many of them. As shown below many users still don't seem to be very familiar with the options the Internet as a fairly young medium offers. It seems that many still consider the Internet to be a substitute of printed media. The term "interactivity" might even be too technical for many respondents to have been understood properly. Internationally Internet-based consultations including e-mail as a means of interacting online with health care professionals seem to be hardly used at present, but might gain significant importance in the future [15-19].

Data safety and security, easy comprehensibility, and many quality indicators are rated the more important the more frequently the Internet is accessed. On the other hand this does not apply to other quality indicators and interactivity as an advanced technical feature. It seems that using the Internet sensitizes to certain issues. That other issues are not considered very relevant might be due to the fact that the Internet is a fairly young medium and experience is obviously limited. The high percentage of less experienced Internet users not rating the assessment factors might indicate that they are rather concerned with other Internet-related issues than with assessing websites.

Easy comprehensibility and quality of medical information are much debated topics in Germany and internationally. Interactive Internet options seem to be largely unimportant in Germany as well as internationally.

5.6.2 Health-related Internet Offers

Whereas a majority of Internet users – approximately two thirds – are searching for health-related information on the Internet, only roughly one third of the Internet users is searching for health-related products on the Internet. Advanced technical options for health-related Internet use such as communicating about health-related topics, managing personal health-related information or accessing personal disease information in a medical institution's EPR are at present hardly used.

The majority of responding Internet users are well or very well educated and under 45 years of age – sociodemographic

groupings which are known to be rather open-minded concerning Internet technologies. On the other hand two thirds of the responding Internet users are women which are known to be less technology- and Internet-friendly. Thus, the sociodemographics of the studied sample might contribute to the low usage of advanced technical Internet offers.

An actual need of health-related information might be expected for the studied sample, since one third of the responding Internet users have experienced severe diseases within the past five years either by themselves or a family member. The information need arising from non-severe diseases and an information need about health in general are not yet included in this figure, and more than 5% of the Internet users did not specify experiencing a severe disease. It might also be assumed that an actual need of health-related information is still primarily conventionally covered.

For most Internet users the Internet still seems to be a new medium they are not very familiar with. The respondents primarily do not see a need or interest in using the respective health-related Internet offer. Many of them are also unaware of the Internet's health-related options. These obstacles to health-related Internet use are in line with the findings about interactivity as an assessment factor for health-related websites.

4.1% and 4.5% respectively of Internet users who are managing or accessing personal health-related information via the Internet seems rather high for the time being. This might show an influence of the GOIN regional network which is rather progressive concerning medical telematics. On the other hand these low figures indicate that these offers are basically not accepted. Whereas web-based personal health-related information is mostly managed by a personal homepage, commercial offers for this purpose are hardly used. Those making use of a homepage for this purpose most certainly are techies taking advantage of latest technical possibilities.

Other obstacles to health-related Internet use as stated by the questioned Internet users are doubts about the quality, usefulness or data safety and security of Internet-based offers. Internationally obstacles to

health-related Internet use have been seen in lack of time, lack of Internet access skills, no motivation, dissatisfaction with the information found, unreliable information presented, and inability to locate the information needed [1, 21].

A study which was conducted in the U.S. examined patients' experiences with and attitudes to a variety of health-related activities on the Internet [22]. These were found to vary widely across the activities; patients were most interested in using the Internet for finding information about diseases and medications [22]. Similar findings have been shown for the general U.S. population [27]. Whereas almost two thirds of adults who are online are looking for health or medical information on the Internet, use of the Internet for other purposes such as participating in an online support group is much less common [27].

Health-related Internet offers are rather accepted by those Internet users who are older, better educated, dispose of a higher income per household, have experienced severe diseases within the past five years either themselves or by a family member, and/or more frequently access the Internet. The course of severe diseases did not influence the usage of health-related Internet offers. These correlations have been confirmed by other studies for income, education, age, and experienced diseases [20, 23-27].

6. Conclusion

Presently the potential which modern information technologies are offering citizens for dealing with their personal state of health in a self-determined and informed manner [41] is hardly used in Germany. The Internet is still a new medium not well known to many. Advanced technical options offered by the Internet are mostly used by techies. Altogether patients still prefer conventional paths of the public health system. Nevertheless, many citizens seem to be open-minded with respect to the Internet – almost 20% of those Internet users not using a medical institution's EPR stated interest.

If health-related Internet use is supposed to play a major part in the near future, the following actions are suggested:

- 1) Continue to spread Internet use
- 2) Inform about eHealth, its options, advantages, disadvantages, and risks
- 3) Inform about and spread the use of quality criteria of (health-related) information
- 4) Inform about eHealth providers and how to access them
- 5) Continue to spread the use of advanced techniques of data safety and security

The younger, the less educated, those earning less, and those less frequently accessing the Internet especially need to be addressed in order to avoid a health-related digital divide.

eHealth will almost certainly gain significant importance in the future. Although the Internet is a fairly young medium, many Internet users are already getting health-related information from the Internet. Thus, patients will be better informed about their diseases and consequently more independent. The physician-patient-relationship will most likely change. These changes have been demanded for several years [42] and are increasingly enabled by recent political initiatives [43-46] as well as newly developed technologies.

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