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D8.1.2: Requirements of the health professional search

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1 Executive Summary

The following report has been written to fulfill the requirements for **Deliverable 8.1.2**. It provides a summary of relevant background literature, and results obtained in a survey conducted within the EU Project KHRESMOI, on the information requirements and online search behavior of medical health professionals. The identification and consideration of user needs and search preferences on advanced options, restriction requirements, tools and layout is aimed at guiding the development of an efficient search engine by KHRESMOI, directly trimmed to the needs of physicians. For this purpose, a multi lingual (4 languages) questionnaire was created on the basis of previous research and preliminary interviews with physicians and disseminated to about 15.000 physicians of all specializations across Europe. The questionnaire consisted of 46 questions (7 parts) about internet access, information needs, use of online resources, barriers to online searching, search behavior and preferences towards an ideal medical search engine.

556 physicians and 4 final year medical students took part in the study. Most participants were internet savvy, came from Austria, Switzerland and the United Kingdom, were above 50 years, stated high levels of medical work experience and education, and were self-employed or employed in public health care settings with regular patient contact. The majority of participants worked as specialists (mostly in the field of internal medicine) or as general practitioners.

Overall, physicians primarily looked for information on drugs, treatment and medical education and predominantly used generic search engines such as Google. Specialists additionally required information on clinical trials and expressed a distinct preference for medical research databases and society websites. In contrast, general practitioners looked for disease descriptions and were most likely to search in the more general health websites.

It was found that both, the need to obtain immediate information (“immediate need”) at point-of-care, as well as the requirement to pursue medical updating (“educational need”) were of substantial importance. General practitioners were the most time-constrained group and devoted significantly less time (less than 20 min) to complex queries than specialists.

The majority of participants pursued a search by typing in keywords, in most cases representing the condition (as opposed to the symptom) then clicked on the link that appeared most relevant whilst frequently skimming through second and third pages of results. With regard to advanced search options most importance was placed on date range and language. Popular restriction criteria were journals, source and books. Quality was primarily rated on the basis of its source (author, publisher) and time of last update. Main barriers to find online information were lack of time to find relevant information, a search output that was too general and of questionable trustworthiness.

When asked to think about “the ideal medical search engine” most importance was placed on the high accessibility of relevant and trustworthy results. Preferred was a display of 5-10 links/page and a categorization based on type of content, author and publisher. A number of tools were identified as important and are expected to improve search efficiency. A novel but very popular idea for a tool comprised of a “quality rating system among physicians”.

Our survey helped us to gain better understanding on how physicians use the Internet to obtain medical information. The requirement for a free medical search engine providing highly relevant and accessible content for physicians is emphasized. The results of the survey should provide an essential contribution towards algorithms, interface design and the data selection within the KHRESMOI project.

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3 List of abbreviations

GAW	Gesellschaft der Ärzte in Wien (Society of Physicians, Vienna)
HON	Health on Net Foundation, Geneva
TUW	Technischen Universität Wien (Technical University Vienna)
HES-SO	University of Applied Sciences Western Switzerland
MUW	Medizinische Universität Wien (Medical University Vienna)

4 Introduction

Over the last decade, the Internet has become an essential medium for communication and knowledge dissemination. Consequently, Internet usage within the general population has grown dramatically and in fact tripled within Europe (59). Currently, 30% of the world's population and 58% of the European population access the Internet (59). The quality (50), as well as the depth and breadth of information available has grown dramatically to the extent that « not being connected » can be a disadvantage (4).

Physicians have been found to primarily access the Internet at « point-of-care », to pursue medical updating (e.g. CME), for education, and to communicate with colleagues (43). There is research to suggest that online information affects medical decision making (48). For example in a survey by Podichetty et. al (2006) 72% of a sample of 277 physicians regularly used the internet to research medical information and 51% of physicians claim that the Internet has influenced treatment and assisted them in the diagnosis of patients. (48). In addition, a recent study by Parekh (2009) 30% of a sample of 411 physicians declared that they « often » change their medication or treatment as a consequence of doing « online » research (5).

4.1 Scientific background

4.1.1 Medical information needs

Physicians typically have concrete and often complex questions during their routine work (10). An understanding of the « questions » is a crucial pre-requisite for the success of any information resource aiming to provide good answers. Research on information needs of physicians has been extensive. However it is characterized by substantial methodological differences, of qualitative- or “observational” nature using small sample sizes. (45). One line of research suggests that physicians mainly seek information on treatment, therapy, diagnosis (61, 45) and about new and existing drugs (7). In a recent review Younger (2010) (7) suggested that questions are often “*complex and multidimensional*” and “*practice related*” (i.e. *should I make this test in this patient instead of “what are the indications for doing this test”*). Questions concern both “*particular patients and different areas of medical knowledge*”. (45). In addition the often “overlooked” need of psychological support, “*affirmation, commiseration, sympathy, judgment and feedback*” readily provided by a colleague has been described as the “*biggest stumbling block to a technical solution*” (45).

4.1.2 Search behavior

An understanding of search requirements and preferences is essential for a tailored design of an appropriate search user interface (52). Up to this date there is relatively little research on how physicians search for online medical information. (52, 53, 56). While there is some research observing how medical information was obtained in simulated situations, we could not find any studies directly asking physicians about their search preferences (i.e. use of advanced search options, use of restriction criteria, tools) as we have done in our survey (5).

There is research to suggest that at point- of-care physicians spend on average two minutes seeking an answer to a question and that if a search took longer; it was likely to be abandoned (10). Such findings suggest that when looking for the answer to patient-related questions at the “point of care” physicians want to find information quickly [58] and efficiently (10).

Previous studies of clinical search strategies have focused on ways to optimize queries sent to information retrieval systems that in turn enhance the performance of the retrieval. Hoogendam et. al. (53) conducted a prospective observational study of how physicians at a hospital used Pub Med to

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search for information during their daily clinical activities. They found that the likelihood of physicians viewing article abstracts returned from Pub Med increased as the number of terms contained in a search query increased. They explain the finding with the fact that more search terms lead to less results and therefore make it less overwhelming to the physician (53). It also could be argued that in the case of complex questions or for questions where other sources do not provide the answer (56) Pub Med is used. This may however in turn be unsuccessful due to the barrier of time constraint (12).

4.1.3 Barriers to information seeking

Barriers to searching for medical information The « questions » of medical professionals often remain unanswered (10) resulting in « knowledge gaps » that could potentially endanger the quality of patient care. Research has suggested that the likelihood that a physician will seek an answer to a question is determined by their belief that « the answer exists and that the problem is urgent » (10). Qualitative research by Ely et al (2005) showed that physicians fail to find the answer to 41% of pursued questions (19).

Ely et. al. (2002) identified the following six barriers to searching for information as being most important; 1) Finding information is too time-consuming 2) Modifying questions into searchable questions- questions are often vague and unstructured 3) Knowing when to stop the search 4) Frustration arising from failure to find an answer from an information resource which was thought to be appropriate 5) Synthesizing multiple sources of evidence into a clinically useful statement (18).

It has been found that one reason for not searching for information during consultations was that physicians believed that a decision can be based on current knowledge (32), however, when physicians use information from their memory it is often wrong or insufficient. (6) Colleagues (27, 28) print and pocket references (30) have often been cited as the first source of information (27, 28). However, textbooks are often out-of- date (3) and journals lack the practical «point-of- care » usability (6). The « colleague » may be a quick, cheap and easy method to obtain information (44), and can provide the often required « psychological affirmation and feedback » (45) that is absent in books, journals and computers. However, it is a source that is prone to error since the physician « answering » the question may sometimes not be more knowledgeable than the physician seeking the answer (44).

Barriers to using the Internet to obtain medical information: It has been found that most questions generated by physicians can be answered using electronic resources (61). However, while online resources have great potential in efficiently assisting physicians in their daily practice (24, 61) they vary greatly in quality (25). Instruments evaluating the quality of health information on the internet exist but their validity and reliability has often been questioned (26). Physicians often lack the time to assess indicators of credibility during the search process. (20). Inadequate quality assessment of online medical information may lead to misleading information (25).

Another problem with the Internet is that online information is often presented in a “disorganized” “overwhelming” manner making it hard for physicians to find relevant answers (61). Also, if physicians believe that finding the relevant answer within an array of overwhelming information of varying credibility « takes too long » they may avoid the internet for important medical questions, assume the answer doesn’t exist and instead prefer « quicker » more unreliable resources, such as the colleague (29) or an out-of-date print source.

Awareness of language as an online-searching barrier in non-English speaking areas is increasing but not well studied, since most research has been carried out in Anglo-American countries (46). Even though, multilingual access to collections of medical documents and images has increased most resources are presented in English (46).

In summary, the Internet as a medical information source of the future appears promising. It not only provides information that is available 24h but also contains a vast amount of high quality medical and

scientific information (50). Thus, the real challenge is to overcome barriers of making existing high quality information easily accessible to physicians in a format that is useful and understandable.

4.1.4 The limitations of existing search engines

The previous paragraphs discussed current literature on physician requirements, use of resources, barriers to pursuing questions and search behavior. The following paragraphs will provide insight on theoretical assumptions of « an ideal information source » and discuss the success of popular existing solutions and discuss the potential « place » of KHRESMOI.

4.1.4.1 Theoretical assumptions

The usefulness of information has been described in a formula by Shaughnessy et. al. (33)

Usefulness of medical information = relevance x validity/work to access

According to the above formula, the ideal information source will be directly relevant, contain valid information, and be accessed with a minimal amount of work. (33) In terms of (subjective) relevance and validity and work to access, colleagues and drug reference books here have the potential to « beat » the internet as an information resource, if the information provided on the Internet is inaccessible due to being « hidden » in large amount of irrelevant information or restricted by « paid memberships » (i.e. work to access is high) (45). In light of this assumption, a search engine (as proposed by KHRESMOI) has potential to provide high accessibility to medical information (i.e. decreases work to access). However, in order to be successful it must also provide high levels of « relevance » and « validity »

4.1.4.2 Strength and weaknesses of existing solutions

Many online sources are available for answering medical questions. As mentioned earlier, relevance, validity of output (33) but also speed and efficiency appear to be crucial « requirements » during information searching of physicians (10, 58). However, the use of an information resource is often pre-determined by its « degree of accessibility » (i.e. work to access). For example, point-of-care

databases such as Best Practice and UpToDate are good at providing relevant, valid answers (65) but are marked by a high « work-to-access » as they are for most physicians not freely « accessible ».

In contrast, “freely available search engines” are marked by high levels of accessibility. A search engine can help a user to gather multiple sources of information and time-efficiently provide orientation in the internet (38). Physicians increasingly rely on search engines as being the tool to help access medical information at point-of-care, for research and for education (1). However, especially « generic » search engines may be time-efficient and free but often lack specificity in providing relevant high quality information to be of use for the professional use within the field of medical care.

Generic search engines, the most popular being Google, have been developed to provide general results for all users. For simple, definitional medical questions several studies have advocated Google as the most popular and efficient search engine. (40, 1, 41, 49). Yu and Kaufmann (2007) demonstrated that, among physicians, Google scored high in terms of quality and ease of use for definitional questions (49). Tang and Kwoon (2006) suggested that Google primarily helps physicians solve patient-related and diagnostic problems (41). A recent study by Thiele et. al (2010) showed that for questions on critical care medicine and anesthesia which had to be answered within 5 minutes Google provided (together with UpToDate) the most correct answers (65).

On the other hand, criticisms on Google regarding the reliability of the information retrieved and validity of the “ranking method” have been made (41). There is growing literature to suggest that Google is not suitable (39) and of low quality (49) for complex medical queries. Leo et. al (2006) showed that for more complex questions only 8% of physicians used a search engine, most accessed targeted sites (39). Berkowitz (2002) showed in an evaluation of 14 search engines that Google

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performed poorly in quality of answer, due to being mainly directed to consumer-orientated sites rather than high-quality medical sites (51).

Another commonly used medical search engine is Pub Med (search engine of Medline). Instead of the “ranking method” of Google, Pub Med returns a list of documents in a chronological order where the most recent publications appear first. The weakness of this system is that the most relevant documents remain hidden (57). As a result it takes 30 minutes on average to find relevant information and appraise the literature critically and for a physician to find an answer (57). For physicians who require “quick” information at point of care such a resource is therefore unsuitable.

Specialized search engines (e.g. Yottalook) have begun to emerge over the last years, to attempt to meet the requirements of specific groups of physicians. However, one of the biggest weaknesses of existing systems acting as specialized medical search engines has been the lack of knowledge on information needs prior to the development of the system (2). Consequently, systems worked well in laboratory situations but often failed to fulfill expectations of physicians in « real-life ».

Overall, the challenge has been to create a system that is tailored to medical professionals, has the benefits of quick access such as Google and at the same time provides up-to-date evidence based on information resources such as Pub Med (57). It seems that both Google and information resources containing aggregated data such as evidence based textbooks offer good information to general questions. However, more complex queries appear to require reviews and more sophisticated information resources. Google provides quick but for complex medical questions often irrelevant or too general results. In contrast, search engines such as Pub Med may provide relevant results but these are too time-consuming and specific to access in the framework of a point-of-care practice.

Specialized search engines have failed to consider physician needs prior to their development. Thus, KHRESMOI will try to overcome this by first investigating how physicians search and then developing the system to fulfill their needs.

4.2 The requirement of a survey on information needs, search behavior and preferences

In order to learn about information requirements of physicians, the conduction of a survey measuring the current « state of art » was essential. While there is substantial literature on the general informational needs of physicians, there is lack of research about search behavior and preferences providing concrete suggestions towards an ideal medical search engine.

Secondly, most research on information needs and search behavior, is mainly observational and of qualitative nature. Consequently, there is little research including larger sample sizes, presumably because it is hard to persuade already time-constrained physicians to participate in scientific research. We did not find large-scale quantitative research on search preferences. Despite being aware of the limitations of self-reporting, the advantages of a quantitative study with a high sample size have the benefit of potentially representing a larger amount of physicians and specialties.

Thirdly, most literature in the field has been carried out outside Europe and in English-speaking countries. Consequently, multilinguality has been rarely addressed in previous studies and it is unclear to what extent these findings are applicable to European users.

Finally rapid technological advances of the last years such as the introduction of mobile devices have made it difficult for research to « keep up » in identifying what is required. Thus, with our survey we hope to advance previous research, address current requirements of European physicians on a quantitative level and consequently provide a good foundation for the development of a medical search engine for KHRESMOI.

The aim of KHRESMOI is to develop a multilingual medical search engine tailored to the needs of physicians. In order to « learn » from mistakes of « existing » unsuccessful systems, which have often

“blindly” designed a system without considering the actual physician need, we have developed a survey to measure physician requirements in Europe prior to the development of a system aiming to fulfill the requirements. The survey aims to identify information needs and search preferences of physicians of all specialties across Europe. The results of the questionnaire should be able to help understand how physicians search for information, what resources they prefer, what information they need and what barriers or problems exist with current solutions.

5 Methodology

5.1 Participants

In order to be eligible participants had to be either a physician or a final year medical student. This was ensured by asking the question “Are you a physician or final year student” on the first page of the survey. (See Appendix, Section 11.1). Only participants answering the question with a “Yes” were subsequently forwarded to the link of the study.

5.2 Questionnaire design

A questionnaire was designed to fulfill the objectives of the deliverable in measuring information needs and online search behavior of physicians. The questionnaire was developed, discussed and finalized by the GAW in collaboration with HON. The first version of the questionnaire was based on theoretical assumptions of current literature. In a pilot phase we conducted 12 interviews with Austrian physicians (specialists and general practitioners) to test the validity and reliability of the questions whilst allowing room for extension, modification and deletion of items.

The influence of previous literature on questionnaire development: Past research has differed tremendously on a methodological level and in the measurement of the concept of need (61). In the first version of the questionnaire we partially adapted the measurement of need to the first level of the taxonomy proposed by Ely and colleagues (12) in differentiating between diagnosis, treatment, management, epidemiology and non-clinical questions. Previous research was also used to inspire the creation of a list of barriers (18) resources and guided the construction of items on search behavior (5). However, while the literature provided a good structural basis and starting point most items were modified, extended or deleted to fit the requirements of European physicians after doing preliminary, structured pilot interviews.

The influence of structured interviews on questionnaire development: The results of the interviews are excluded from the analysis as they were of informal nature, mainly contained qualitative aspects and were primarily carried out to aid questionnaire development. While previous literature gave us a good basis for the structure and rough content of the questionnaire, subsequent validation was crucial since previous research had largely been carried out in the Anglo-American area. Thus the interviews allowed us to modify the questionnaire to fit European requirements. By questioning physician’s face-face we were able to gain insight into the resources, needs, barriers and preferences of European physicians and modify items accordingly. In addition to that, the results of the interviews emphasized the need to differentiate between the “immediate” need at point of care and the less immediate « educational need ». General practitioners appeared more time-constrained and patient orientated while specialists presented themselves as more research orientated. Consequently, we added a question which differentiated between different types of needs to ensure all groups are addressed by our questions. We defined the « Immediate need » as all information a doctor requires at « point-of care » « within ten minutes ». Non-immediate need is all information required within two days. An educational need was defined as the requirement to advance and update medical knowledge.

Validation and Translation: The questionnaire was then discussed with and validated by HON, TUW and HES-SO. The final version was then translated by GAW into German and by HON into French and Spanish. Prior to online dissemination an « online test period » of 1 week allowed further evaluation of reliability, validity and assessed the adequacy of the length of the questionnaire. Twelve physicians in the United Kingdom and Austria filled out and « tested » the questionnaire. In response to subsequent physician feedback the questionnaire was shortened and partially modified to ensure high levels of readability.

5.3 Questionnaire Structure

The final version of the questionnaire (Complete version see Appendix Section 11.1) consisted of 7 parts and a total of 46 questions assessing the current online search behavior (Part 4), internet access (Part 1), use of online resources (Part 2), problems to online searching (Part 5), informational requirements (Part 2) and expectations (Part 6) towards an ideal solution of physicians of all specialties. Below is a summary of each part of the questionnaire.

Part 1. Internet Access (8 questions)

- Frequency, medium and experience of overall Internet access
- Frequency and medium of internet access during professional situations
- Use of physician network communities

Part 2. Medical Information Need (3 questions)

- What kind of information do physicians look for?
- What drug related information do they look for?
- What type of need do they primarily have (immediate, non-immediate vs. educational need)

Part 3. Information resources and consequences (2 questions)

- What online information resources are currently used?
- What actions are carried out as a result of obtaining clinical information online?

Part 4. Search behavior (11 questions)

- Amount of time spent on complex questions
- How is the search phrased (question vs. keyword, condition vs. symptom)
- Use of restriction criteria
- Use of advanced options
- Choice of link among results
- Criteria used to rate the quality of search output
- Success of online information retrieval (Frequency of failure to retrieve answer, perceived reason and consequence of information retrieval failure)

Part 5 Barriers (1 question)

- Barriers to internet use for medical information retrieval

Part 6 Expectations towards an ideal medical search engine (7 Questions)

- Which characteristics of a search engine are important?

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- Preferences of display, categorization and format of search results
- Importance of different tools and search options
- Advertisement placement
- Other ideas/suggestions

Part 7 About yourself (14 Questions)

- Socio-demographic characteristics (Age, gender, education, employment status, type of work, place of work, number of patients, specialization, country, mother tongue, level of self-perceived medical English competence)
- Homepage of browser
- Contact details (voluntary)

5.4 Procedure

5.4.1 Timeline

Once the validation and evaluation was complete, the questionnaire was uploaded to the HON webpage where it was disseminated electronically to physicians around Europe.

Overall, the following timeline was followed:

Questionnaire preparation: December 2010 – May 2011

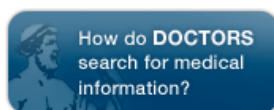
Online survey: 11th of June 2011 – 10th of July 2011

Structure: Seven parts and 46 questions in total

Available in four languages (English, Spanish, French and German)

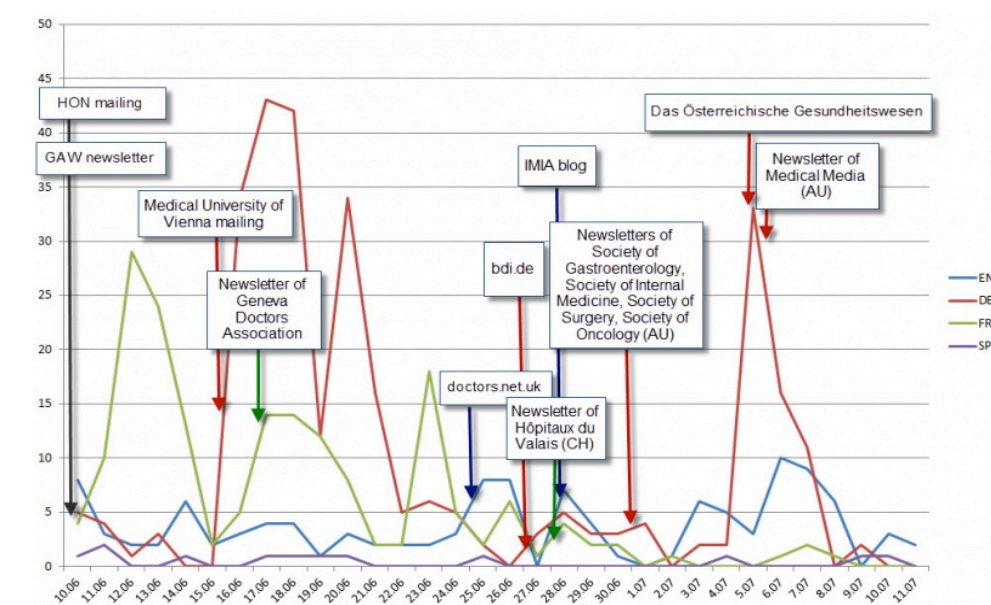
Link: http://www.hon.ch/Global/pdf/complete_en.pdf

5.4.2 Promotion



To promote the Survey we constructed a banner leading to the link of the study (see above) and a promotion text for newsletters (See Appendix Section 11.1). The target population comprised of physicians of all specialties and final year medical students all over Europe. In June and July 2011 an E-mail including information and the request for participation (see Appendix 11.1) was sent out to about 15000 physicians around Europe.

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The Figure above illustrates the different levels of promotion and the subsequent response rate

The following institutions sent out a newsletter with the link and information on the study:

- Society of physicians Vienna
- Newsletter of Geneva doctors Association
- Austrian society of internal medicine
- Austrian Society for Gastroenterology and Herpetology
- Newsletter of the medical Media in Austria

Following institutions placed our banner on their website:

- Doctors.net.uk
- Society of physicians in Vienna (GAW)
- Health on Net Geneva (HON)
- Professional association of German internists (BDI)
- Furthermore, the banner was placed on Face book and Twitter to enhance further promotion (see Appendix 11.2 for screenshot)
- European Academy of Allergy and Clinical Immunology

5.5 Categorization of Data

Overall: In order to ease graphical display of data for the variables, mothertongue, country and specialties groups which had a sample size below 5 (i.e. $n < 5$) were collapsed to be part of “Other” in the main analysis. (5.1-5.6) However, the full list (with answers) can be viewed in Section 11.3 of the Appendix.

- **Age -Young vs. old:** For the purpose of statistical analysis (Section 6.7), age was collapsed into two groups, below 50 year olds and above 50 years old.

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- **Primary vs. secondary care providers** : For purpose of statistical analysis (Section 6.7) the sample was split into primary and secondary providers

Two groups; “primary providers” and “secondary providers” were created on basis of reported specialities. These groups were then used to explore whether there were significant differences.

Primary care providers included physicians where patients would go to without requiring a referral and who stated that they are specialised in the following fields:

- Internal medicine
- General practice
- Obstetrics and Gynecology
- Child and Adolescent medicine

Secondary providers included physicians where we assumed that patients would have to first see a primary care provider for a referral. We included physicians specializing in the following areas:

- Neurology/psychiatry, Urology
- Anesthesiology and Critical Care Medicine
- Radiology
- Orthodontist and Dental Medicine
- Dermatology
- Emergency Medicine Ophthalmology
- Otolaryngology
- Physical Medicine and Rehabilitation
- Nuclear Medicine
- Diagnostic Laboratory Medicine

5.6 Statistical analyses

All statistical analyses were performed using SPSS 11.5 for Windows and are described in Section 6. All tables including details on missing data and all responses can be accessed in Section 11.3 of the Appendix. All graphs were constructed using Microsoft Office Excel 2007.

Section 6.1-6.6 : Descriptive statistics : Descriptive statistics were used to calculate frequencies, medians, and means of categorical variables and mean values for continuous variables. Frequency tables and graphs were constructed to describe and illustrate demographic characteristics and survey responses. (Section 5)

Section 6.7 : Analysis Differences between independent variables (i.e. demographic factors) were tested using a Mann-Whitney U Test for categorical variables. An overall alpha level of $p > 0.05$ was used.

6 Results

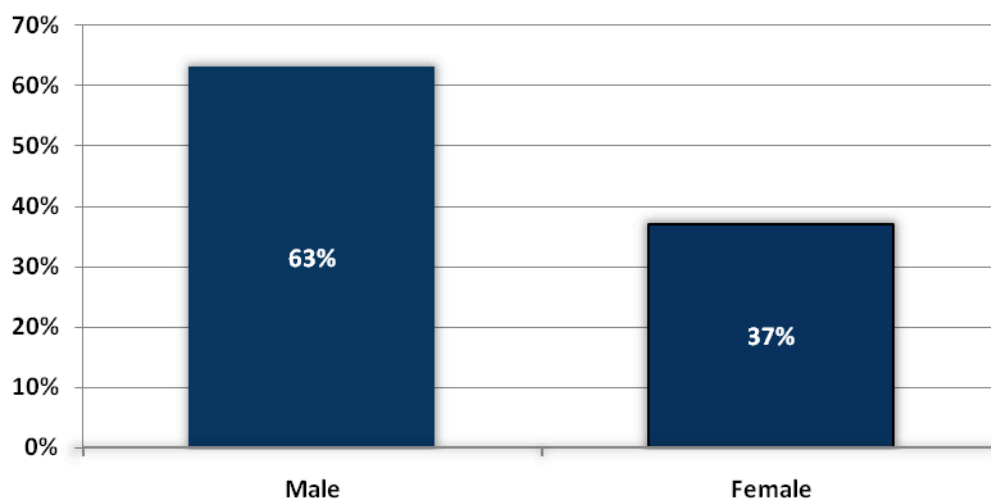
Sections 6.1-6.6 illustrate all descriptive results obtained in the survey. In Section 6.7 an analysis of interesting trends within the data is given.

6.1 Demographics

Of the initial 640 participants taking part in the study, eighty participants were eliminated from the analysis to address partially missing data. Questionnaires were excluded if less than 30% of the questions were answered (i.e., at least 14 out of 46 questions had to be answered).

One reason why we did not delete all questionnaires with missing data was because it would have created a sample bias. For example, it was important to include physicians who selectively failed to fill (about 23%) out the demographics section, to avoid creating a bias through deletion of physicians who perhaps merely assured extra confidentiality. Percentages are based on the valid sample (i.e. excluding missing data) within each variable. The size of the valid samples will be mentioned throughout the analysis and can be obtained in detail from the tables in the Appendix. (Section 11.3)

Figure 1.1 Gender*

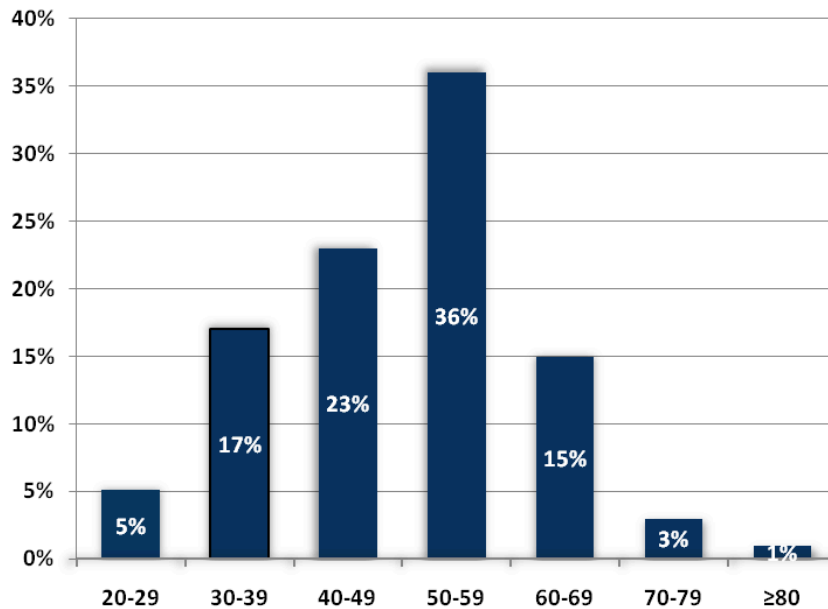


* Based on a sample where N= 434

This resulted in a total sample of 560 participants, the majority of which were male (n=273, 63%, Figure 1.1)

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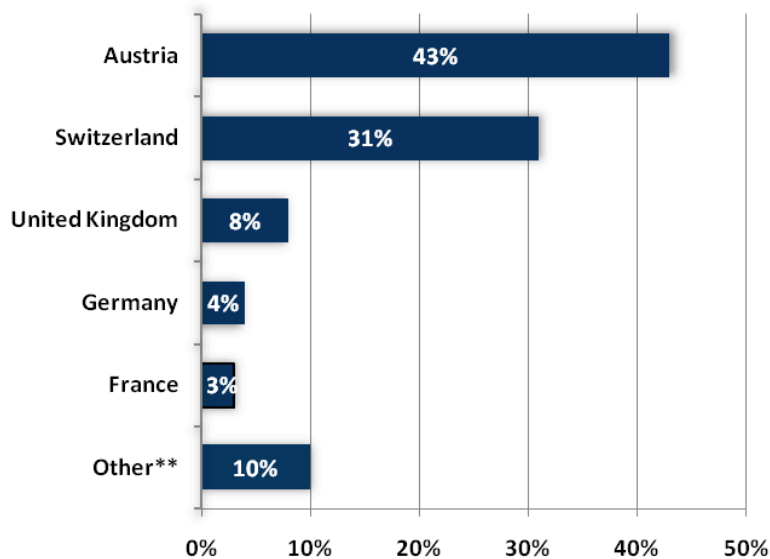
Figure 1.2 Distribution of Age*



* Based on a sample where N= 434

55 % (n=239) of the participants were older than 50 years (Figure 1.2).

Figure 1.3 Distribution of Country*



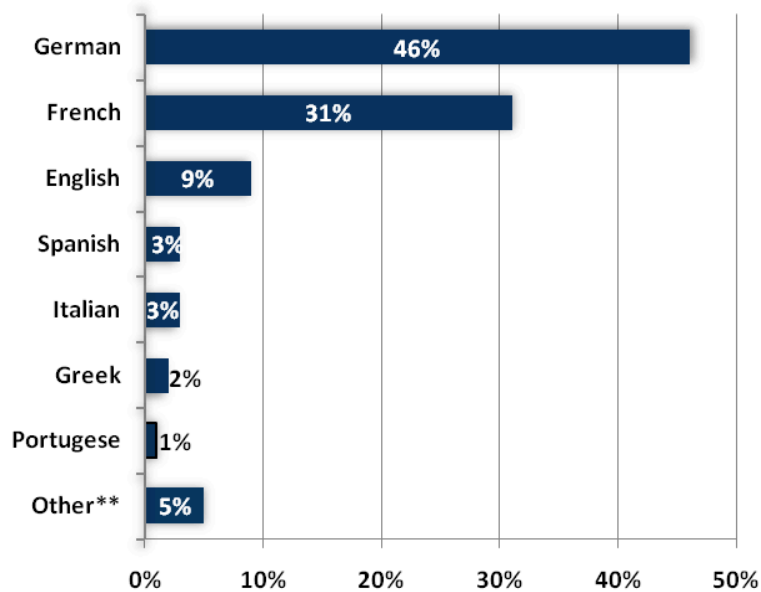
* Based on a sample where N= 558

* Details on the category "Other can be obtained from the Appendix

As shown in Figure 1.3 most participants came from the main areas of dissemination; the majority came from Austria, almost a third from Switzerland followed by the United Kingdom and France.

D8.1.2 Requirements for the health professional search

Figure 1.4 Distribution of Mothertongue*

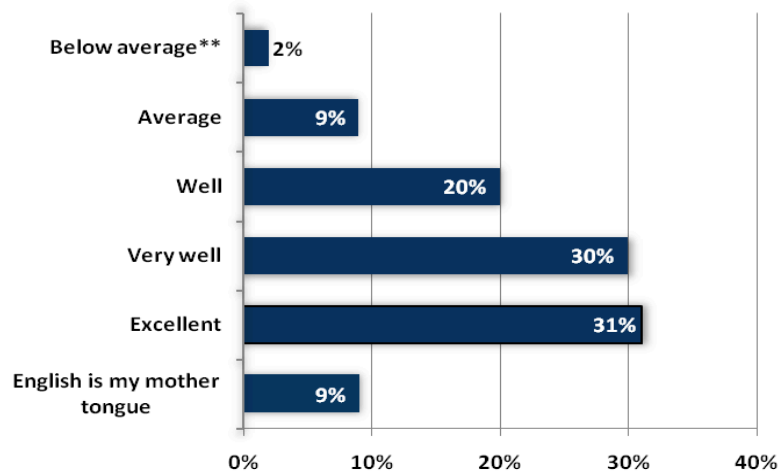


* Based on a sample where N= 435

** Details on the category "Other can be obtained from the

Most participants spoke German or French. (Figure 1.4)

Figure 1.5 How well do you understand medical English?*

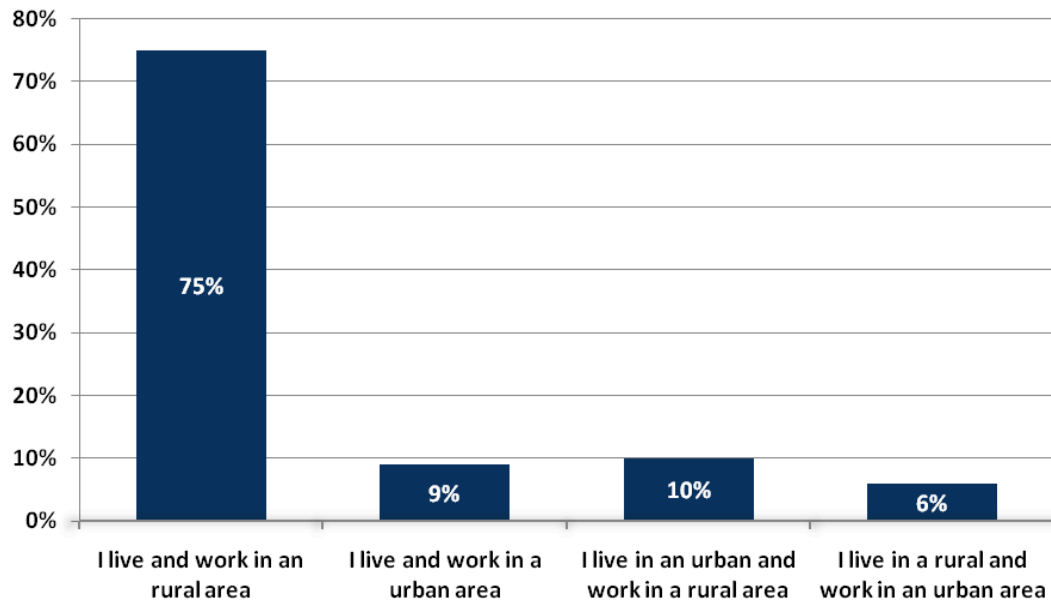


* Based on a sample where N= 433

** The category "Below average" includes self-perceived "Poor" (n=1) competence and the category "I don't understand any English (n=1)

As shown in Figure 1.5, over 60% of the participants reported that they understand medical English "Well" or "Very well, with only one participant reporting not understanding any English.

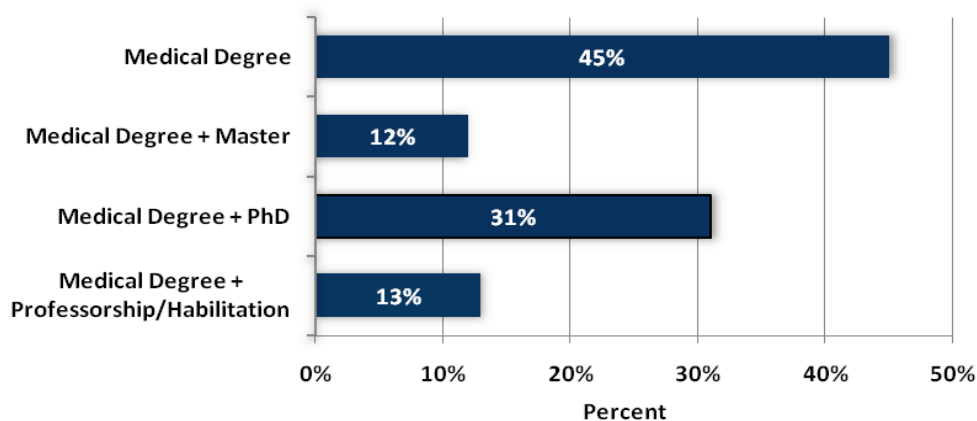
Figure 1.6 Where do you live and work?



* Based on a sample where N =431

As illustrated in Figure 1.6 most participants reported living and working in rural areas, reflecting again the place of dissemination.

Figure 1.7 Level of education*

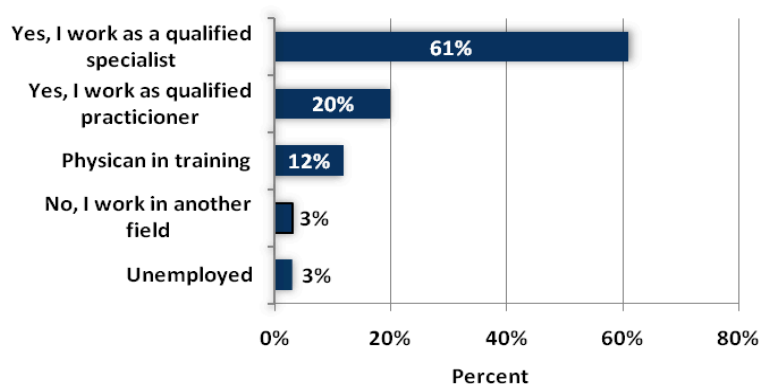


* Based on a sample where N =435

Question: "What is your highest completed academic degree?"

The level of education and experience was exceptionally high (Figure 1.7). 43% of participants (n=185) were physicians with a PhD or a Professorship. (Figure 1.7) Over a half of the respondents reported to have work experience of "20 years or more" (n=238, 55%).

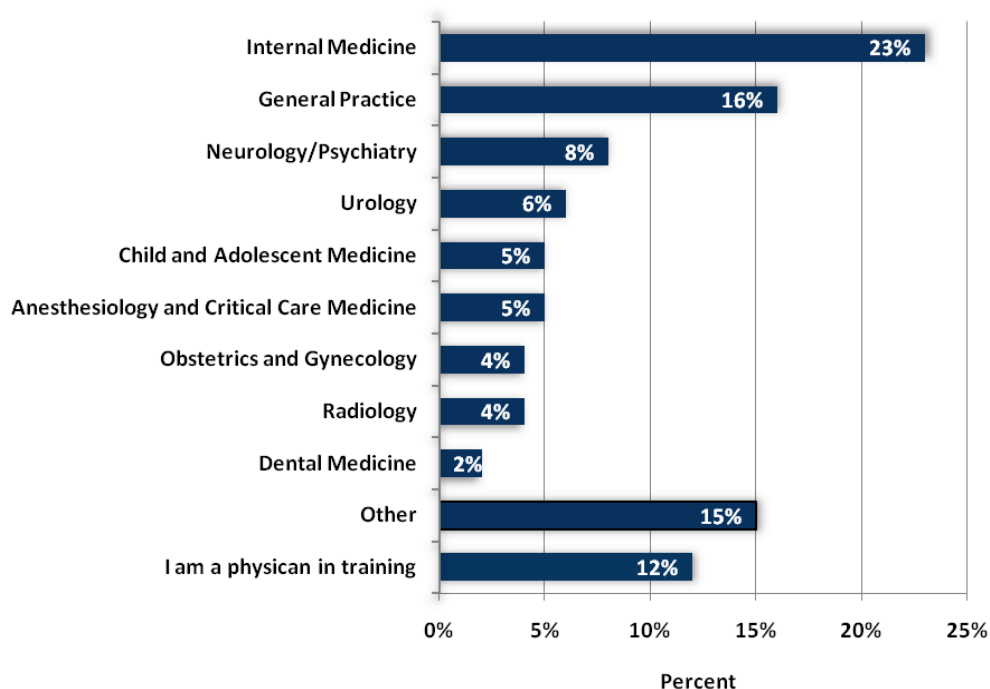
Figure 1.8 Do you currently work as a physician?*



* Based on a sample where N= 435

Over 90% reported being currently employed. (Figure 1.8) Most were self-employed or worked in public health care settings, only 3% (n=15) were retired or unemployed. (See Appendix 11.3) As shown above most physicians reported currently working as specialists, 20% as general practitioners and 12% currently pursued a physician training (Figure 1.8).

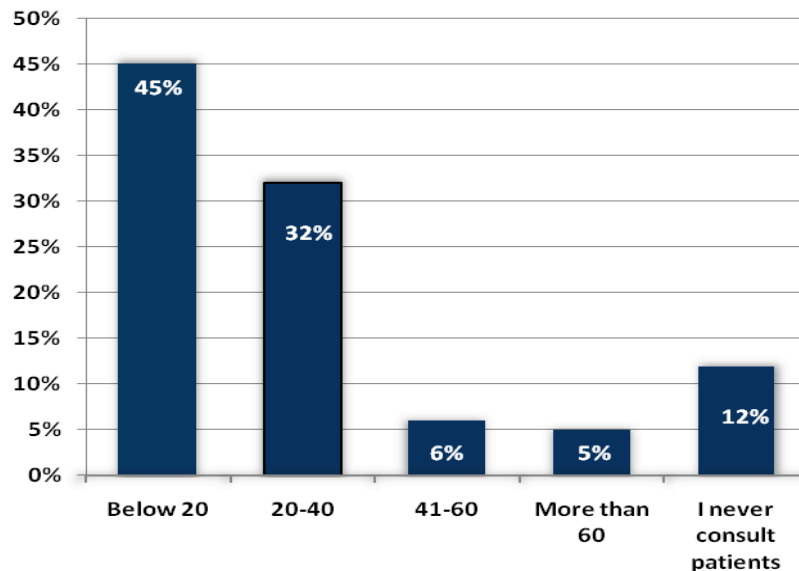
Figure 1.9 What's your main specialization?



* Based on a sample where N= 431

Most of the physicians were primary care providers (n=208, 48%-see Section 11.3 in the Appendix for further details) and as illustrated in Figure 1.9 specialized in either General Practice (16%) or Internal Medicine (n=99, 23%). (Figure 1.9)

Figure 1.10 Number of patients consulted per working day*

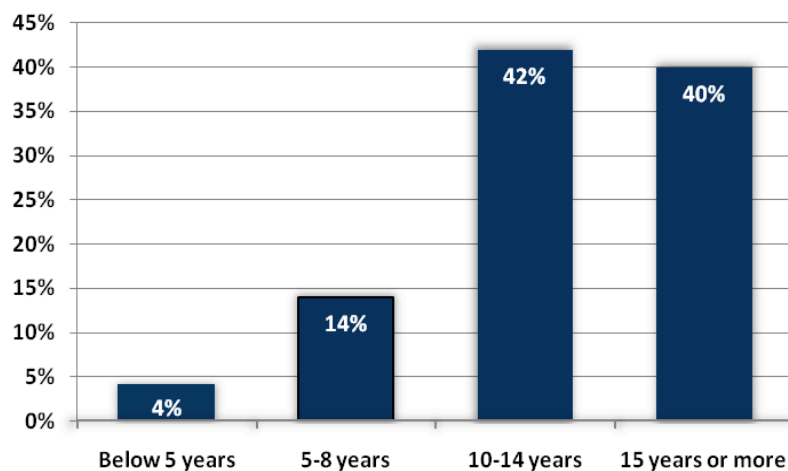


* Based on a sample where N= 441
Question: "How many patients do you consult per working day?"

While 88% of participants reported that they saw patients on a regular basis, the majority of physicians consulted less than 40 patients/working day (Figure 1.10).

6.2 Internet access

Figure 2.1 Internet experience

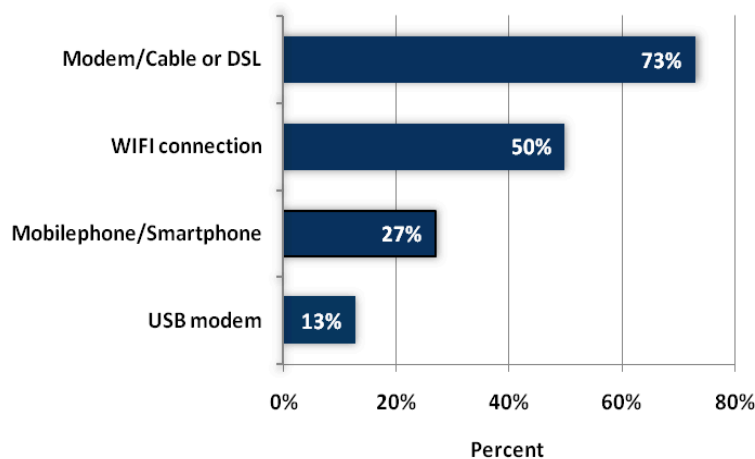


* Based on a sample where N=559
Question: "How long have you been using the Internet?"

D8.1.2 Requirements for the health professional search

99% (n=552) of the total sample reported having regular Internet access while 91% (n=510) report accessing the Internet on a daily basis. (See Section 11.3 in the Appendix for further details). High levels of Internet experience, over 80% (Figure 2.1) had been using the Internet for over 10 years, were reported.

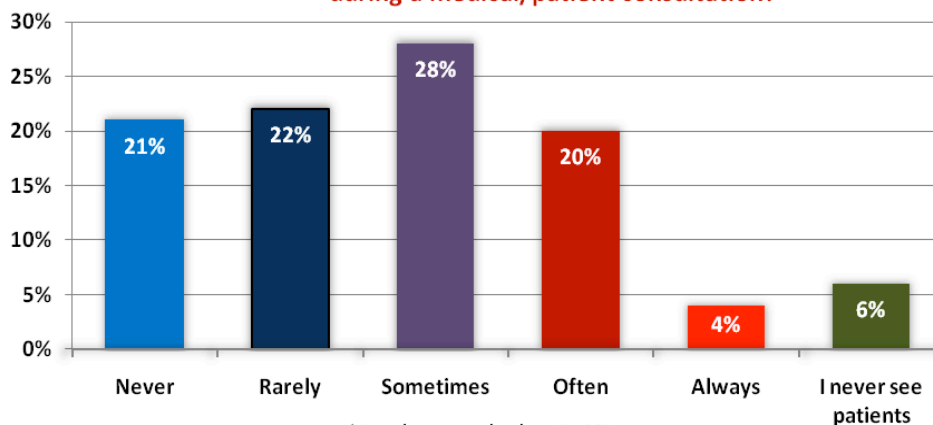
Figure 2.2 How do you connect to the Internet?*



* Based on a sample where N= 455 and multiple responses were allowed

Most participants reported connecting to the Internet via Modem and WIFI. More than a quarter (27%) reported using a mobile phone/Smartphone to connect to the Internet. (Figure 2.2)

Figure 2.3 How often do you access the Internet during a medical/patient consultation?*



* Based on a sample where N= 558

24% reported that they frequently access the Internet (often or always) during a medical/patient consultation. (Figure 2.3)

D8.1.2 Requirements for the health professional search

Figure 2.4 What is the device you use the most to access medical information/do medical updating on the Internet, in the following situations?

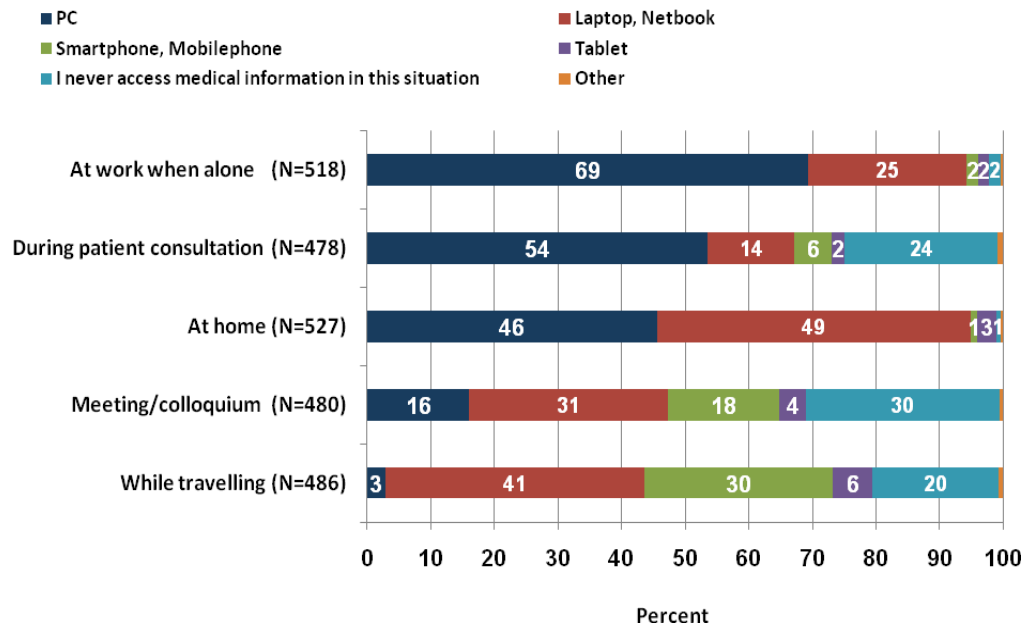
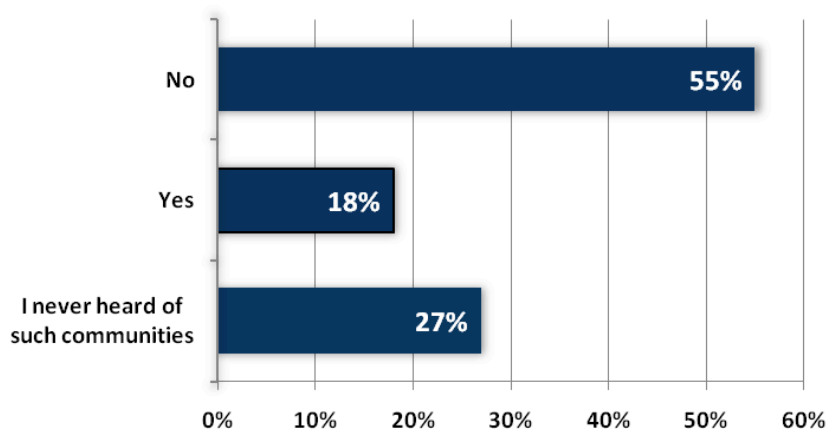


Figure 2.4 illustrates that when comparing which devices physicians use in different situations the PC and Laptop/Net book play the dominant role. While the PC is used mostly at work, the Laptop appears to dominate during meetings, at home and during travelling. Mobile devices were predominantly used during travelling and meetings.

Figure 2.5 Do you access or take part in online physican society communities?*

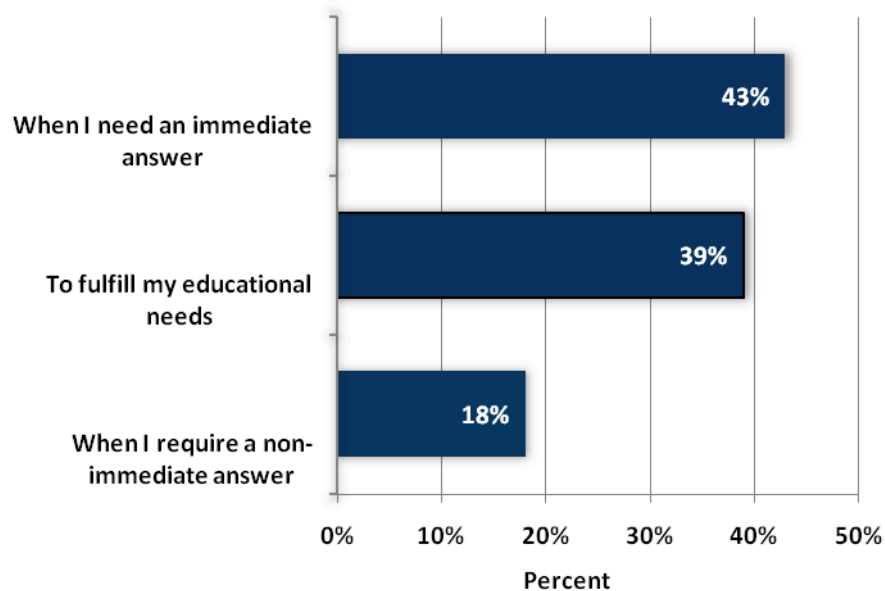


* Based on a sample where N = 553

Online physican society communities were relatively unknown (27%) and unaccessed (55%). (Figure 2.5) Only 18% reported using such communities. Of those who did use them, the most popular physican society communities reported were “Doctors.net” (n=10) and “doc2doc” (n=8). Further details can be viewed in Appendix 11.3.

6.3 Medical information Need

Figure 3.1 When do you use the Internet most for professional purposes*

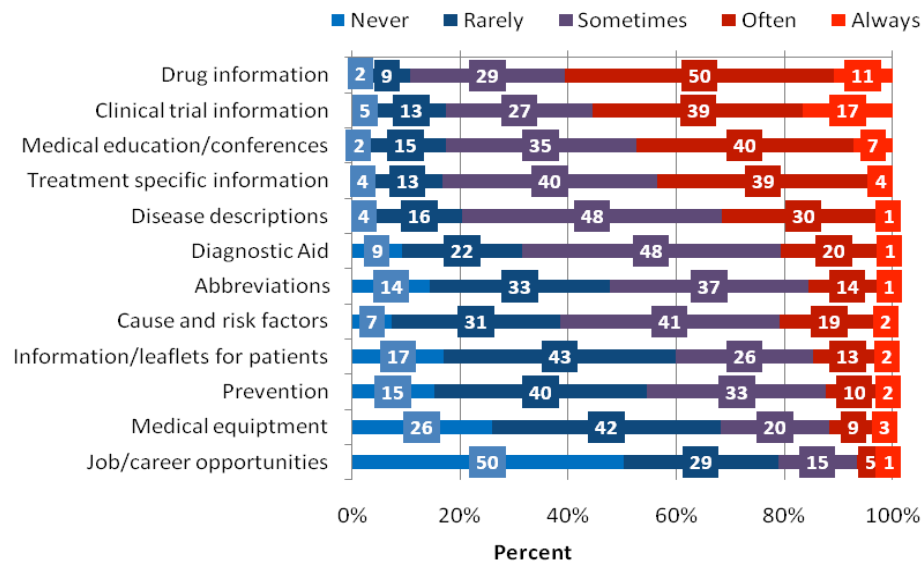


* Based on a sample where N= 500

An interesting finding was that the main types of reported “need” were of “immediate” and “educational” nature. Thus, it appears physicians predominately have the requirement to do medical updating or to answer immediate questions at “point-of-care”. The non-immediate need where physicians have a day or two to find answers to clinical questions played a minor role. (Figure 3.1)

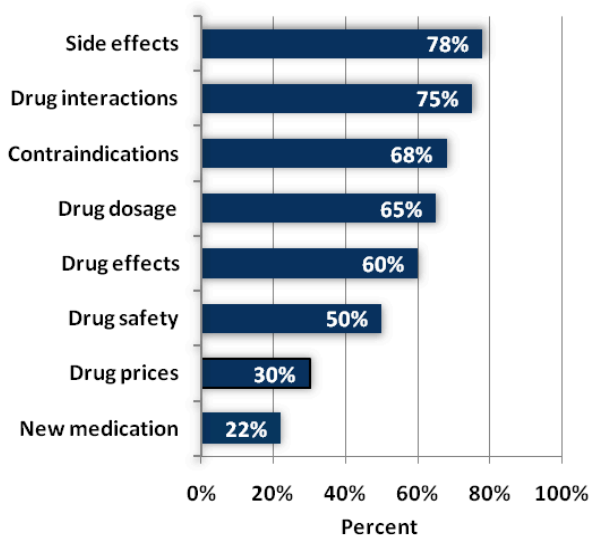
D8.1.2 Requirements for the health professional search

Figure 3.2 What kind of medical information do you look for as part of your daily practice?



As illustrated in Figure 3.2, the most important need reported was information about drugs, clinical trials, medical education/conferences as well as information about treatment and condition.

Figure 3.3 What drug information do you look for in your daily practice?*



* Based on a sample where N= 487 and multiple responses (N=2188) were allowed

In line with previous findings, side effects, drug interactions, contraindications and information about drug dosage were reported as the most “looked for” types of drug information. In contrast to previous research (7), “new medication” played a relatively minor role (Figure 3.3).

Figure 3.4 How often does obtaining online information lead to the following actions?

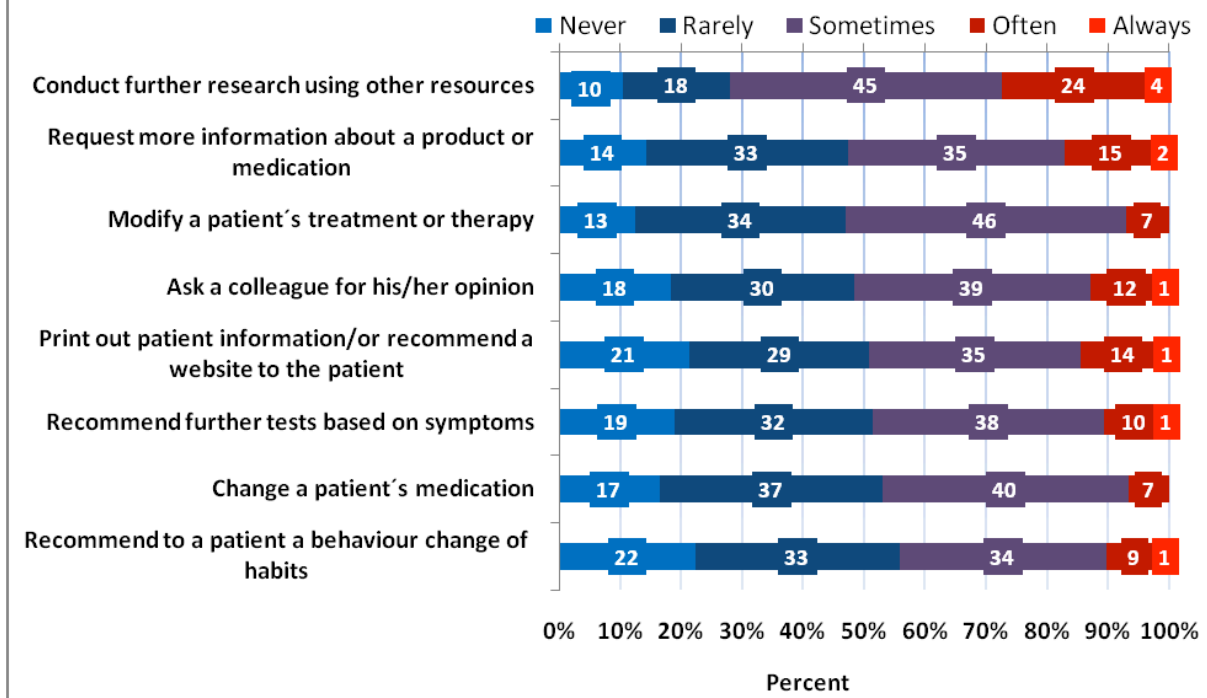


Figure 3.4 illustrates the influence of online information on medical decision making. Influence on behaviour was moderate. Consequences of online information retrieval were mainly research- rather than patient-related (conduct further research, request more information about a product). However, as much as 7% report changing a patients treatment/therapy often and 35% sometimes, as a consequence of obtaining information online. As much as 13% reported “often” or “always” asking the colleague after finding information on the Internet.

6.4 Resources

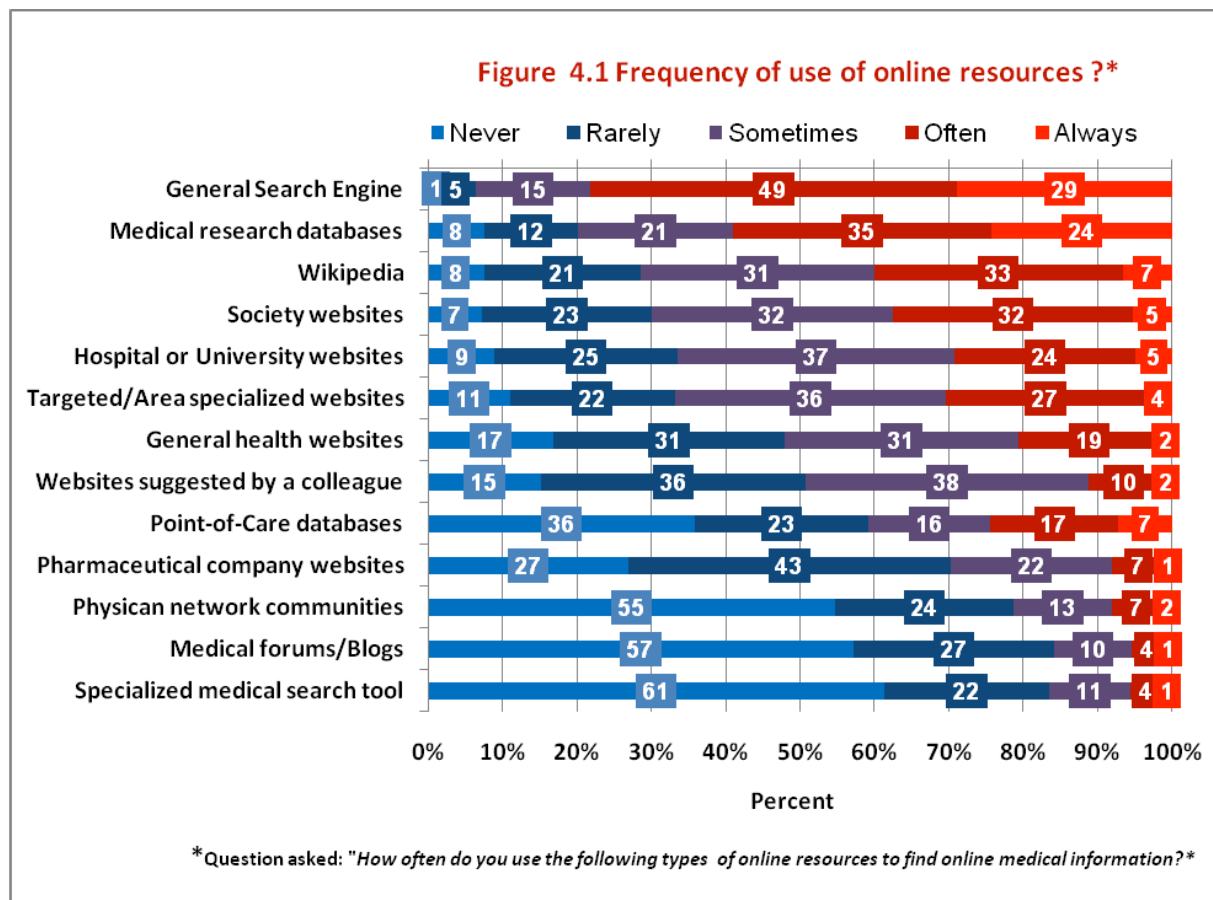
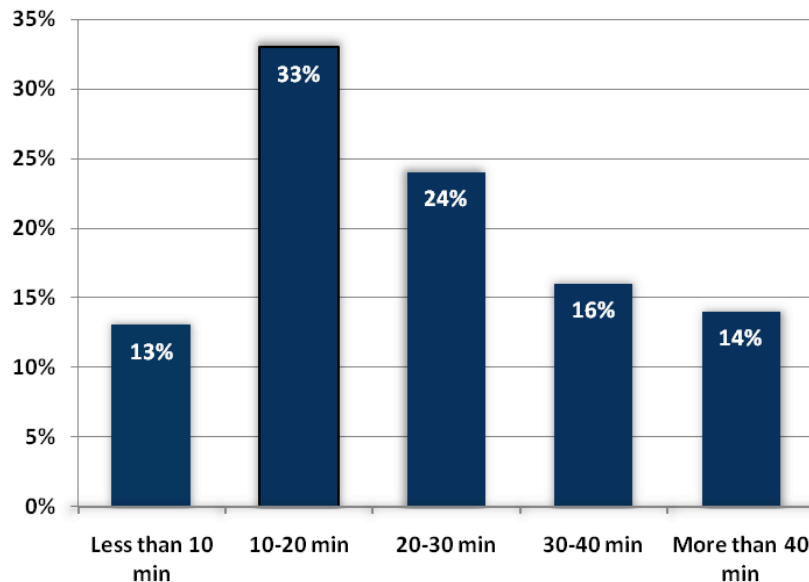


Figure 4.1 illustrates the type of online resources that were reported to be used when looking for medical information online. General search engines, medical research databases and Wikipedia were stated as being the most frequently used online resources. Surprising is the popularity of society websites. It is important to distinguish between medical society websites and physician society communities. Medical society websites (i.e. websites representing (groups of) physicians) are often packed full of high quality information and for this reason may score high in terms of “specificity” and “relevance”. The more unpopular physician society communities are platforms where physicians can exchange professional information and queries (e.g. Sermo). A possible indication of the ineffectiveness of current solutions is the unpopularity of the “specialized medical search tools”.

6.5 Search behavior

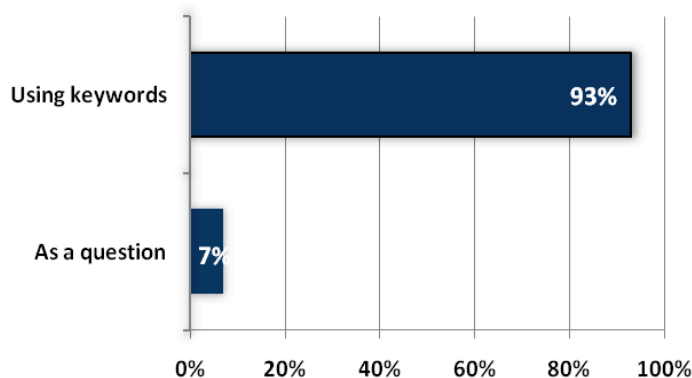
Figure 5.1 How much time, can you or are you generally willing to, spend on trying to find the answer to an important complex clinical question?*



* Based on a sample where N= 460

A surprising finding was that despite the majority of participants working in primary care and declaring the requirement of “immediate need” a third of participants stated that they can devote as much as 10-20 min to important problems. A total of 54% declared that they can devote more than 20 minutes to important medical problems. As much as 14% could devote more than 40 minutes. (Figure 5.1)

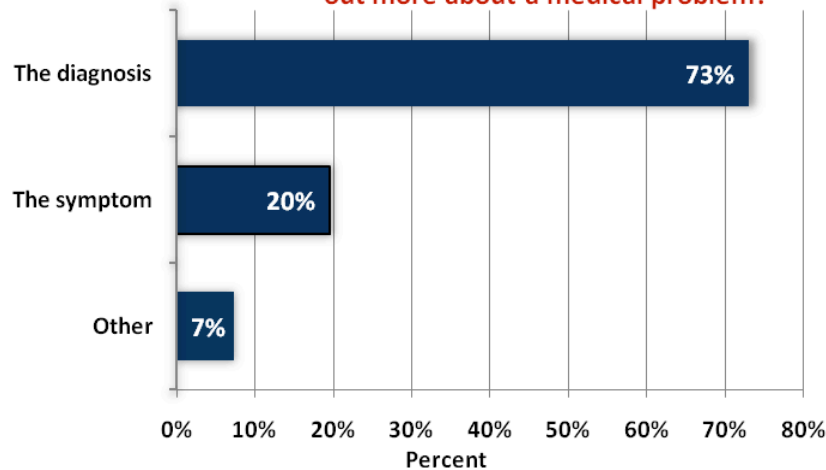
Figure 5.2a How do you usually phrase your search when using an online search engine?*



* Based on a sample where N= 455

When asked what they type into the search bar, most participants reported typing in “single key words” (93%) rather than the question format imposed by systems such as MedQ (Figure 5.2a).

Figure 5.2b What do you usually first type into the search bar when you want to find out more about a medical problem?

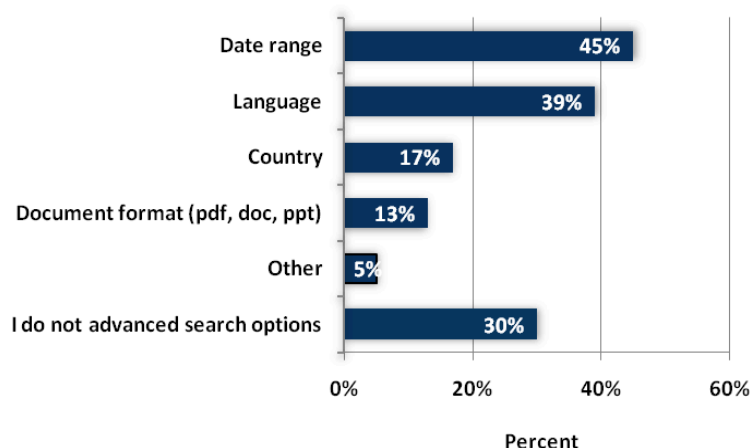


* Based on a sample where N=449

When searching for an answer most respondents approached their search on basis of diagnosis (i.e. condition) and not the symptom. (Figure 5.2b) Upon creation of this item, we hypothesised that a physician would have a diagnosis in their head and type that into the search bar. Our findings confirm this notion. An open answer analysis to this question showed that some participants additionally type in the name of a medication or treatment into the search bar or type in the diagnosis in combination with the symptom (See Appendix Section 11.3).

When confronted with search results most participants clicked on the source which appeared most relevant (65%, n=295) and checked the second and third page (47%, n=212) of results (See Appendix 11.3).

Figure 5.3 Which advanced search options do you mainly use?*



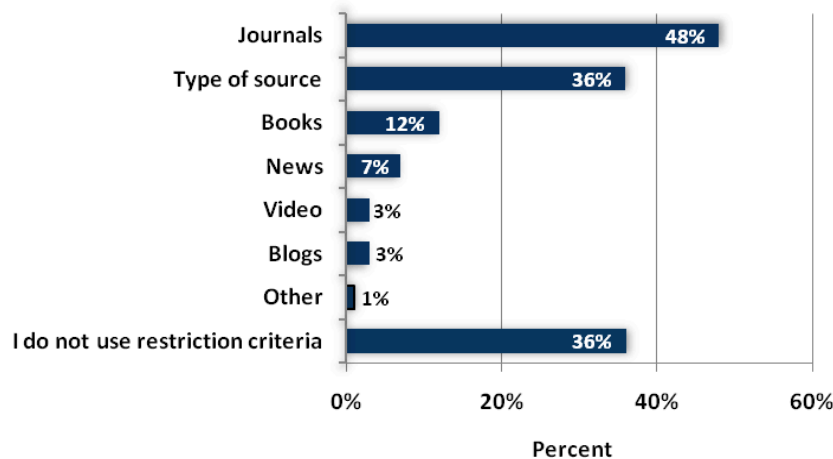
* Based on a sample where N= 457 and multiple (N=683) were allowed

When asked about advanced search options (Figure 5.3) almost half of the participants reported using date range while 30% of the participants reported not using advanced search options. It further confirms previous assumptions (45) that physicians look for “recently published information. As much

D8.1.2 Requirements for the health professional search

as 39% filter information on basis of language when searching for information. Such a finding suggests that the barrier of language is more dominant that it would appear from the high self-perceived English competence of participants.

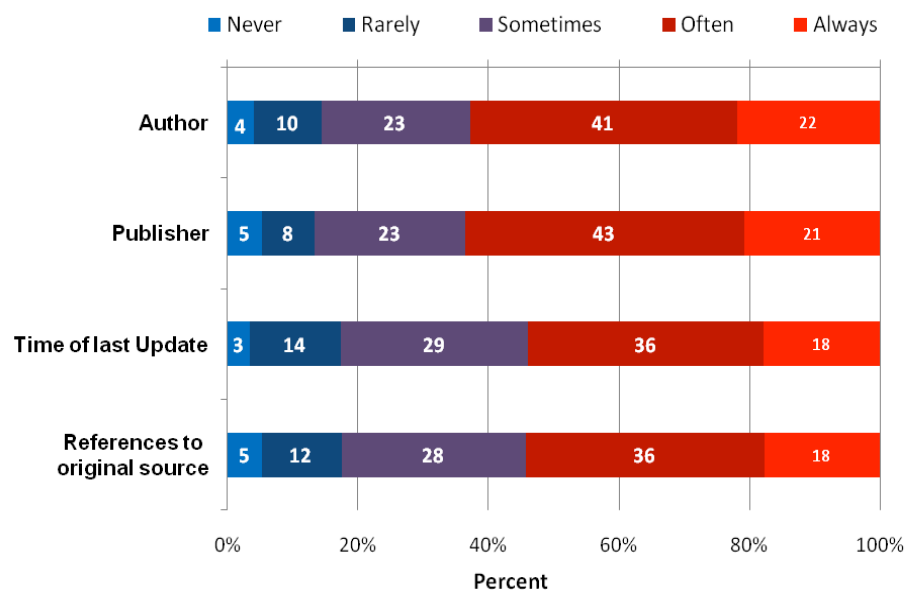
Figure 5.4 What restriction criteria do you use?*



* Based on a sample where N= 443 and multiple answers were allowed (N=773)

In line with the finding that medical databases are important, the most frequently reported restriction criteria were journals and type of source. Suprising was that still 12% filtered their online information on the basis of available text book titles. Similar, as it was the case with advanced search option as much as 36% report that they did not use restriction criteria (Figure 5.4).

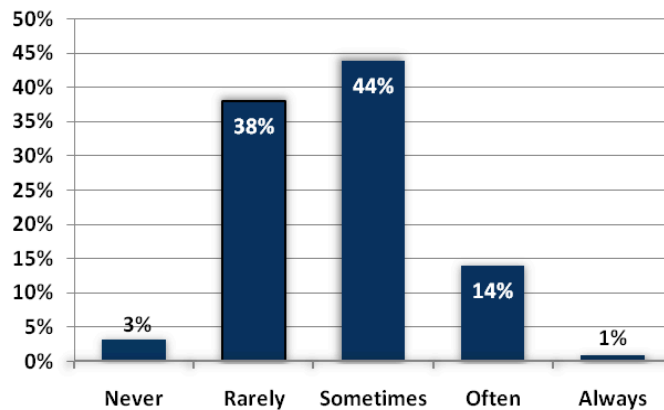
Figure 5.5 How often do you use the following criteria to rate the quality of the information you retrieve from the Internet?



As illustrated in Figure 5.5 participants reported that they rate the quality of information retrieved on the Internet on basis of source criteria such as author and publisher. However, time of last update and reference to original source were also regarded as “very important” quality markers.

D8.1.2 Requirements for the health professional search

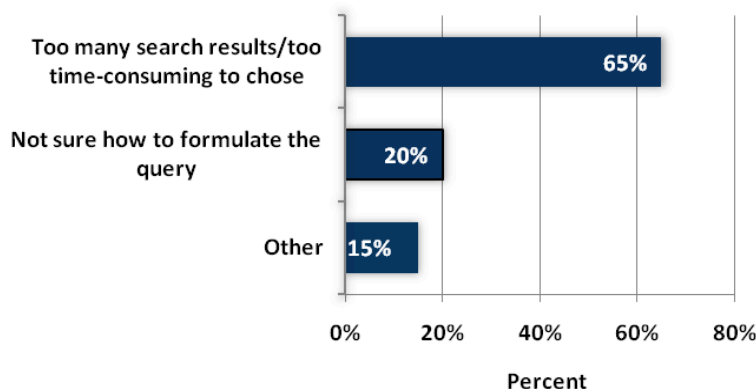
Figure 5.6 How often do you face situations where you cannot find the answer to a medical question on the Internet?*



* Based on a sample where N= 457

While a large amount the respondents (41%) reported that they “rarely” or “never” get into the situation of failing to finding the information they require on the internet, as much as 15% find themselves often or always in this kind of situation (Figure 5.6).

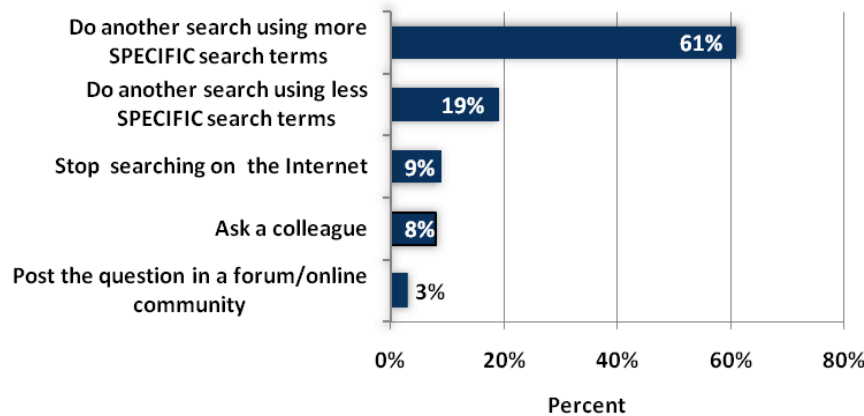
Figure 5.7 What is the most common reason you fail to find an answer?*



* Based on a sample where N= 433

When asked about the situation where the answer to a medical question is not found online, most participants (65%) state that the reason is that being overloaded by too many search results makes it too time-consuming to chose relevant information. (Figure 5.7) 20% were not sure on how to formulate their query. An open-answer analysis of the category “other” (see Appendix Section 13.3 for further details), showed that additional problems were that participants believed that the answer didn’t exist, that their problem was too specific or complex, search results were too general/superficial, too practical-orientated or that the answer was hidden in inaccessible resources.

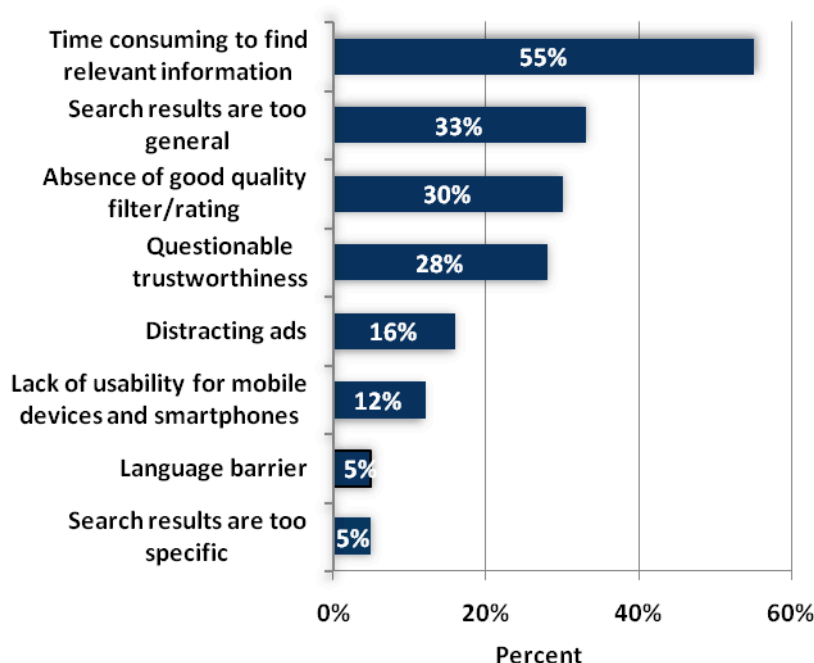
Figure 5.8 What do you usually do when you search online for a problem and the relevant answer does not show up?*



* Based on a sample where N= 442

As a consequence of failing to find the answer to a medical question most participants (61%) report that they do another more specific search (Figure 5.8). This suggests that in most cases they obtained results that were too general. As much as 8% turn to a colleague when they fail to find the answer in the internet.

Figure 5.9 Barriers to finding medical information online



* Based on a sample where N= 434 and multiple responses (N=1160) were allowed
Question: "What difficulties do you face when searching for medical information online?"

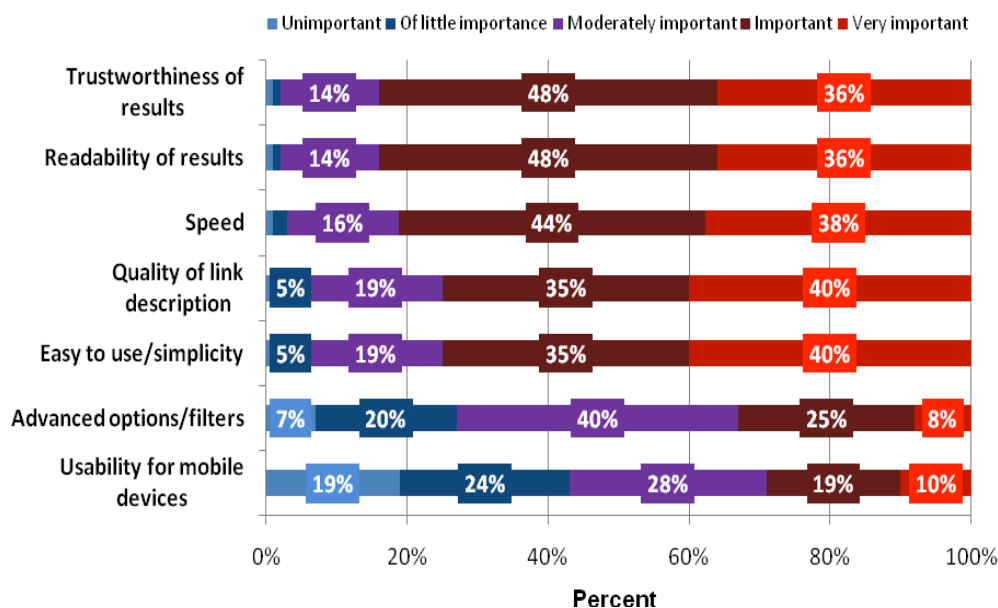
In line with the results about why participants fail to find an answer, the most frequently reported barrier to online searching was that it was "too time consuming" to find relevant information (Figure 5.9). The problem that "search results are too general" is not surprising, considering that most

D8.1.2 Requirements for the health professional search

participants report the frequent use of generic search engines to obtain medical information. Other problems such as “lack of quality” and “questionable trustworthiness” were in line with previous findings on barriers. (19). It is surprising that only 5% reported language as a barrier when considering that as reported earlier a much larger proportion filter their results by language.

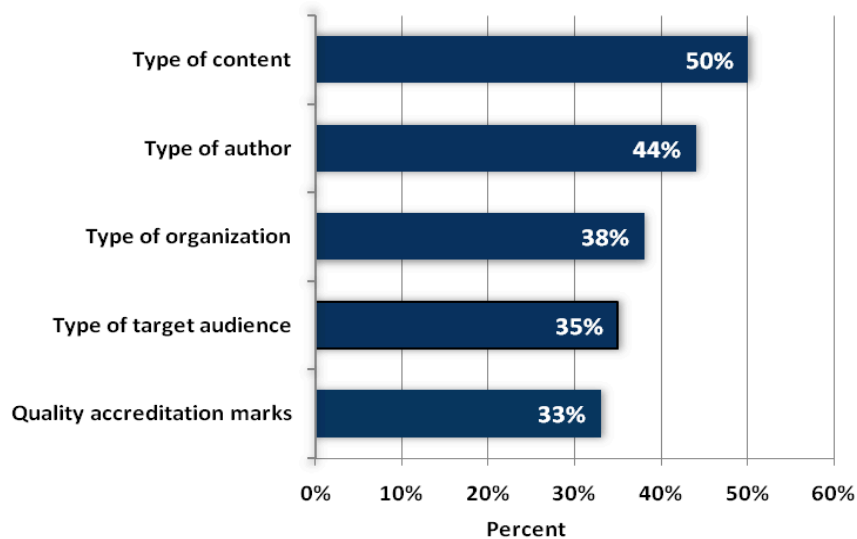
6.6 Expectation towards an ideal medical search engine

Figure 6.1 How important are the following characteristics of a search engine to you?



When asked about the ideal characteristics of a search engine, relevance of results (median= very important) and trustworthiness of results (median= very important) were rated as the most important characteristics. Readability of results, speed, quality of link description were on average rated as “important”(Figure 6.1).

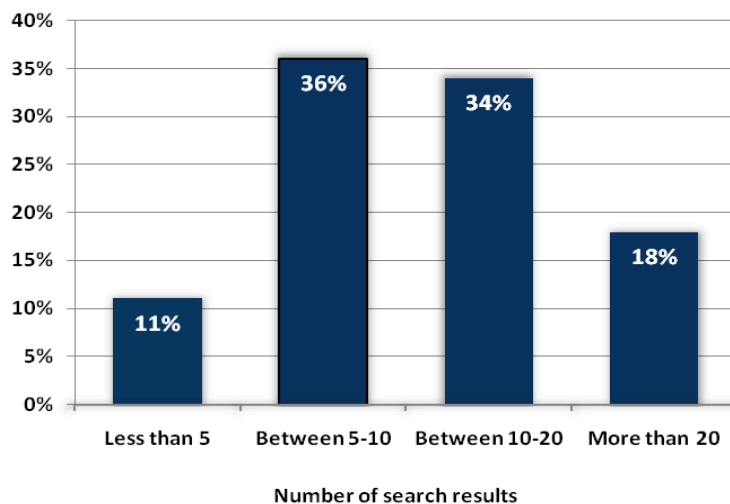
Figure 6.2 Please choose how you prefer the search results to be categorized?*



* Based on a sample where N= 263 and multiple responses (N=569) were allowed

As shown in Figure 6.2, information was most frequently categorized on the basis of “type of content” and source attributes (type of author, type of organisation)

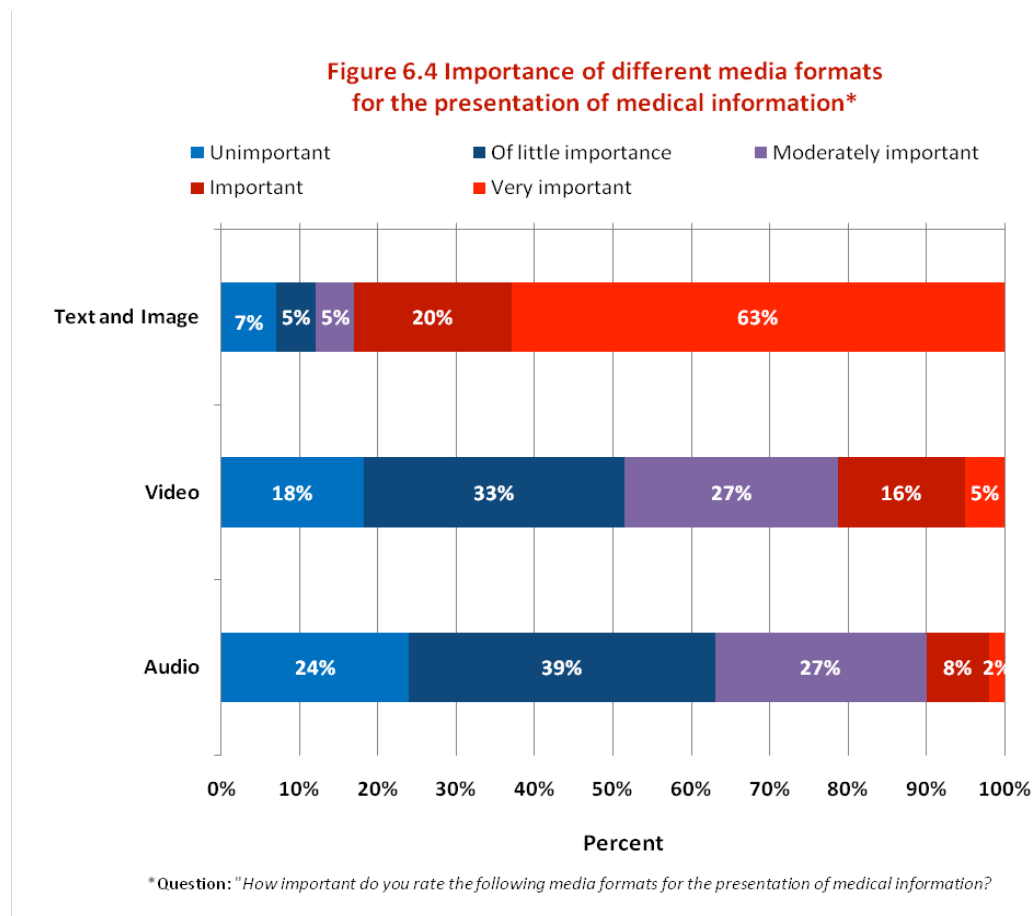
Figure 6.3 How many search results do you prefer to be displayed on one page?*



* Based on a sample where N= 436

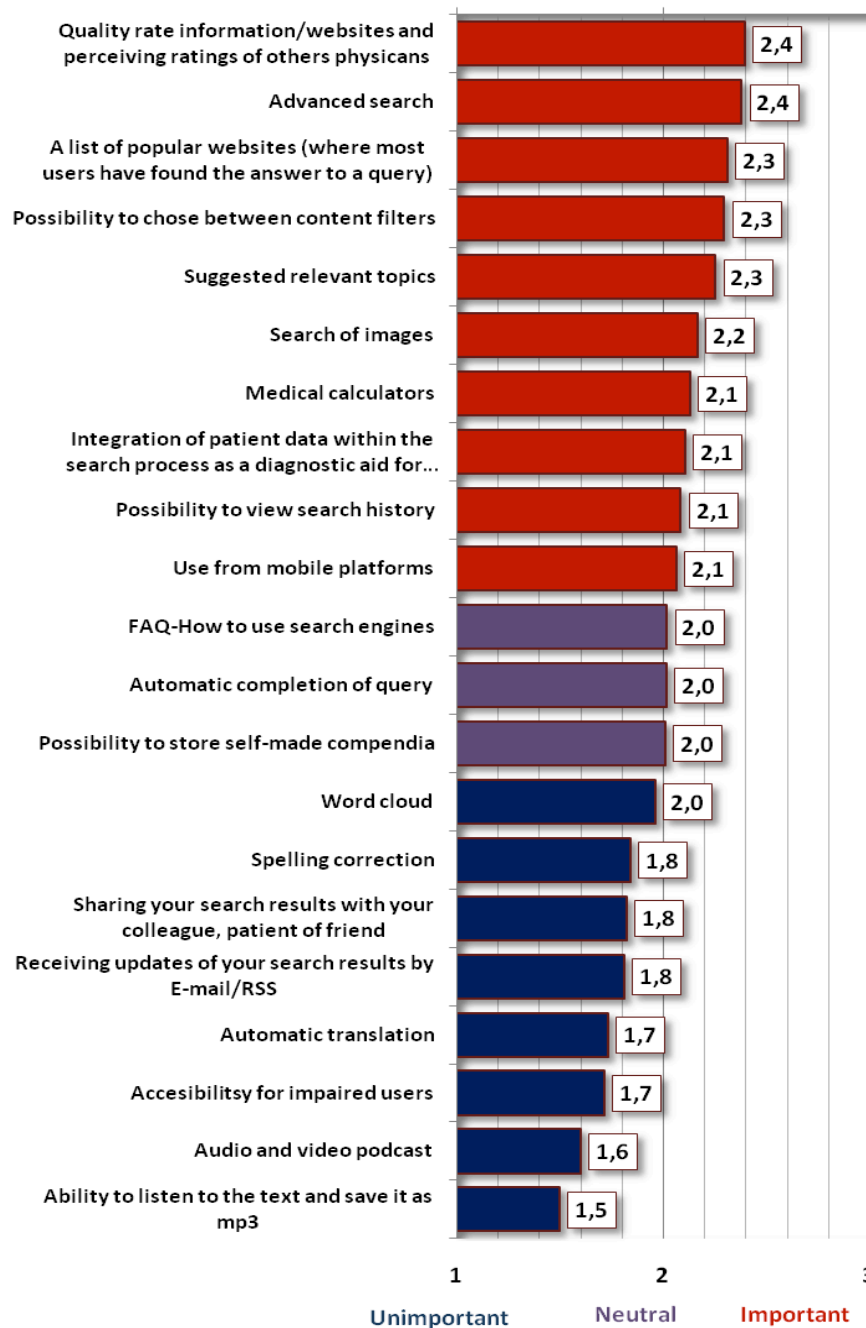
In terms of the display of search results, most participants reported preferring 5-10 results on one page (Figure 6.3).

D8.1.2 Requirements for the health professional search



When asked about different media formats, print and image were cited as being the most important (83%- important or very important) form of presenting medical information. Video was rated by 21 % as an important or very important medium for the presentation of medical information (Figure 6.4).

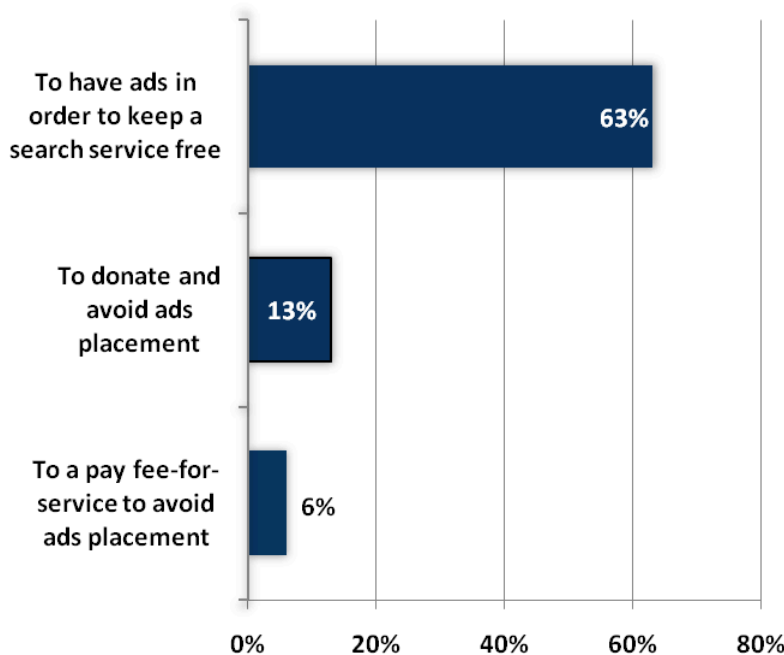
Figure 6.5 How important do you rate the following tools?*



*Values display the mean of responses
 Respective sample sizes can be viewed in the Appendix

When asked about which tools they preferred an interesting result was that the most important tool was “being able to quality rate information/websites and perceiving ratings of other physicians”. Despite a third reporting that they do not use advanced search options, advanced search was regarded as important. In Figure 6.5 all tools marked in red, were on average regarded as important.

Figure 6.6 Would you prefer...?*



* Based on a sample where N= 418

As shown in Figure 6.6 most participants preferred to have the placement of advertisements in order to keep a search service free. Only 24% would be willing to subscribe to a membership or pay for a fee each time to avoid advertisements.

Further suggestions towards an ideal search engine- an open answer analysis

When participants were asked to make further suggestions towards an ideal search engine, the main topics which came up in the answers were: free accessibility, a simple, userfriendly design, a search engine that was restricted to medical professionals, allowed secured communication among colleagues, was rated on the basis of quality, relevance, source and how up-to-date, included guidelines and (national) drug information to aid diagnosis, addressed different areas of medicine, stored recent search options and was somehow comparable to the simplicity of existing generic search engines. Interesting was the suggestion of a “medical wikipedia”. The following list provides the list of answers provided.

Free accessibility

- *A search engine that is financed by the medical council membership fees*
- *A search engine that is free or financed by the health system*
- *I am not going to use it if I have to paid having google, and the same if it has more ads than google*
- *My answer to question 6.6 is “medical information must be free and without ads*
- *Free accesibilty to high quality information*

Simple Design :

- *Simple user friendly design*
- *« Basically KIS for us computer challenged older Docs »*

D8.1.2 Requirements for the health professional search

- *Keep it simple !!! Assume minimal IT knowledge
I would like the search engines to be more user friendly*
- *Something simple, accesible to the beginner in informatics, without technical words and allow you to learn step by step*

Restricted to medical professionals and allowing secured communication among medical professionals

- *A high quality, easy accesible interface soley for physicans*
- *Should be restricted to medical professionals only*
- *Information should be separated: for professionals or general public*
- *No insight for lay people as I do not want them to come again and say » Doctor, I looked for my symptoms, you must do a magnetic resonanz screening »*
- *Restriction to professional information (filter out lay peole information and ads)*
- *Specialised, secured physican communities where we can exchange knowlegde about patient cases with other physicans*
- *Medical wikipedia?*
- *Physicans should have a free access platform where they could discuss the cases and update their knowledge with data from the last scientific conferecnes and sympiosiums worldwide*
- *I would support community solutions (by public services, swissmedic, Swiss Federal office of Health)*

Quality ratings/rankings- relevance, source, level of evidence, up-to-date

- *Grading of results according to readability, relevance and authority of source*
- *Good overview on relevant publications, including an archiv of the last years. The most recent publications in the beginning, quality rated information and display of criteria (evidenz grading)*
- *Indication of the level of evidence.*
- *Ongoing updating of the archives and information*
- *Relevance rankings*

Content :

- *Guidelines to aid diagnosis, library and country specific information*
- *Search engine specific to specific areas of medicine eg. general practice*
- *I am very in favor of guidelines that help you in a practical way f.e.suspected pneumonia: which diagnostic tests are needed, what are the positive or negative results, what is the therapy, the doses and the duration of the drugs needed etc this kind of i specialities*
- *Austria Codex and Pychrembel should be included/accesible*
- *Diagnostic help*
- *electronical libraries like in society webpages*

The search: Search by keywords, disease, correction of input errors

Suggestion of relevant keywords to speed up the search

D8.1.2 Requirements for the health professional search

Search by words about the disease

The input should be flexible- adjust to minor errors

The search results : Link to journals and practical resources, multilinguality

- *Search results- should come from different resources- textbook, guidelines and recent publications and review*
- *Updated information*
- *Link to pubmed and small fee for access to selected, most important, top journals of different*
- *Tools : Storing recent search option and automatic translation*
- *Possibility to store the last used search options (e.g. searching only for professional information)*
- *Automatic translation of specialised english websites*
- *Use of Portuges as a language option*

Learning from other solutions : Google, Wikipedia, Pubmed

- *If all searchengines were as good as google medical or google sclolar my liife would be easier*
- *Similar to pubmed*

6.7 Analysis

The aim of the following section is to evaluate significant differences on basis of age and medical speciality. We were interested in potential differences between specialists and general practitioners and on a more general level between primary care providers and secondary care providers. In addition, we were interested to what extent age played a role in mobile access, information need and use of resources. The evaluation made will be kept simple to meet the objectives ob the deliverable. A more extensive analysis will be provided at a later stage of the project. Results which differed in significance are graphically displayed,

6.7.1 Medical information need

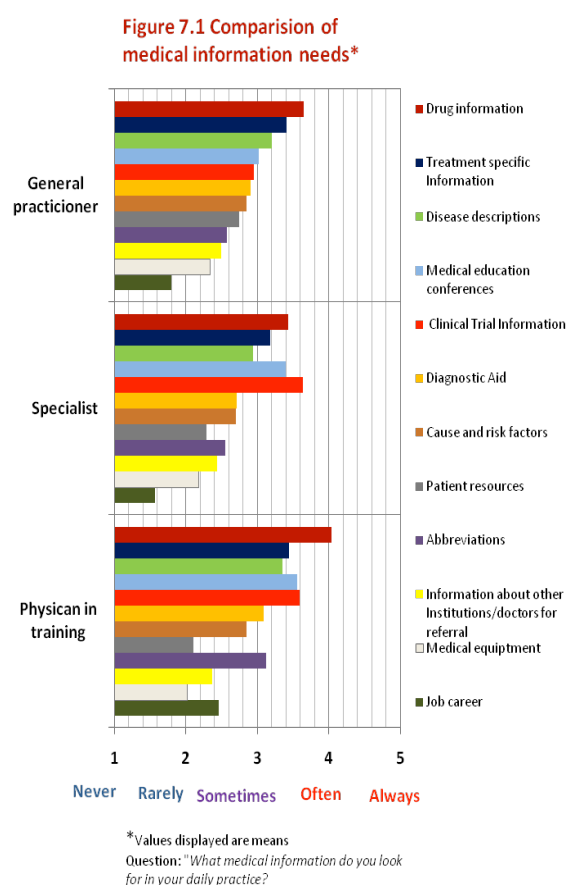


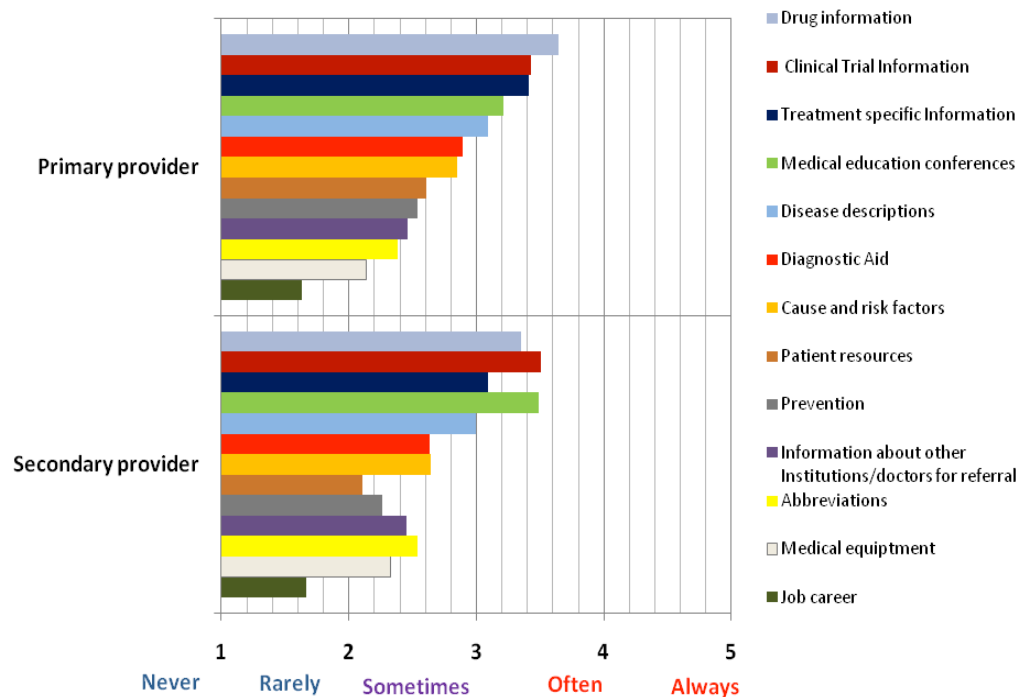
Figure 7.1 above compares the medical information need of general practitioners with specialists and physicians in training. It is illustrated that general practitioners are most likely to look for drug information, treatment specific information and disease descriptions. In contrast, specialists primarily looked for clinical trial information, drug information and medical information/conferences. Physicians in training like specialists followed a research orientated pattern and were additionally more likely to look for abbreviations than the other groups ($p>0.05$).

Table 7.1 Top information needs by profession:

General practitioner	Specialist	Physician in training
Drug information	Clinical trial information	Drug information
Treatment specific information	Drug information	Clinical trial information
Disease descriptions	Medical education/conferences	Medical education/conferences
Medical education/conferences	Treatment information	specific Abbreviations

Table 7.1 illustrates the most important “needs” of each group and highlights that specialists look for scientific information whilst general practitioners primarily require information related to medical care.

Figure 7.2 Comparison of medical information needs*

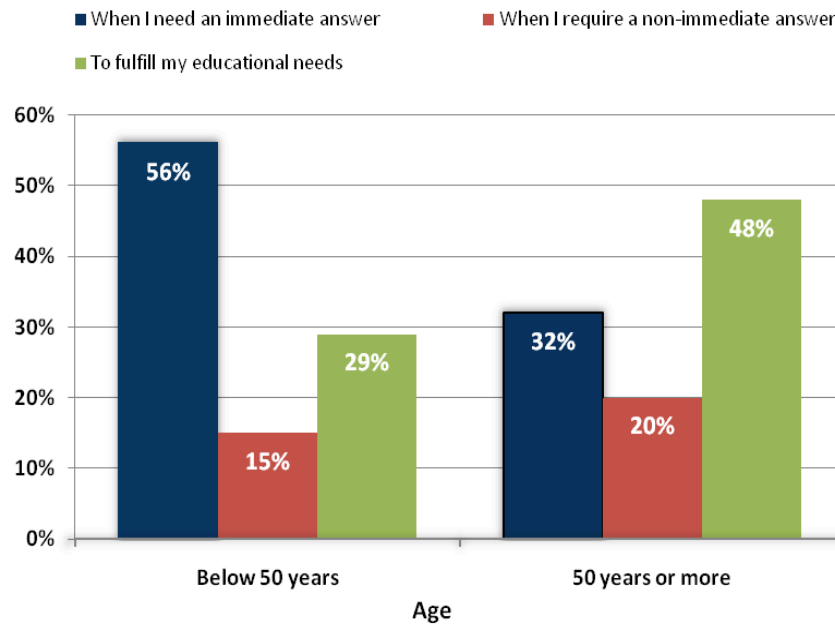


*Values displayed are means

Question: "What medical information do you look for in your daily practice?"

When medical information need was split on the basis of primary provider vs. secondary provider, additional insight was gained. As illustrated in Figure 7.2 secondary providers appear even more research orientated than specialists, with clinical trial information and medical education being the top two information needs. Thus, the findings suggest that specialists, especially when working in secondary care primarily have research orientated needs on medical education and clinical trials while general practitioners and primary care providers require more practical and patient orientated information.

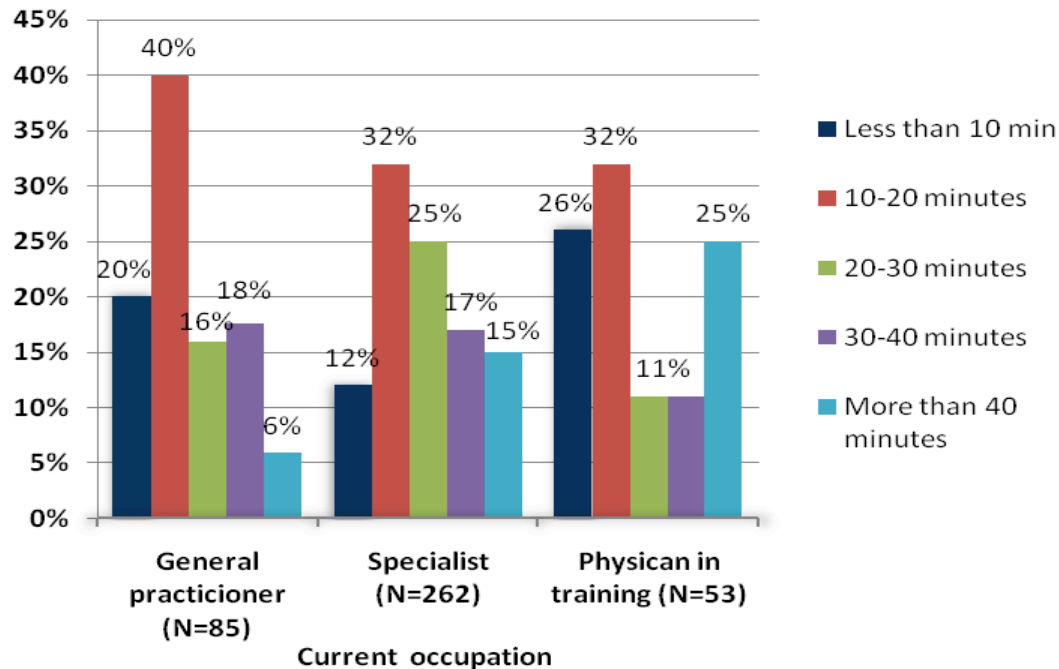
**Figure 7.3 Comparison of young and old:
When do you use the Internet the most for professional purposes?***



* Based on a sample where : Below 50 years N=195 and 50 years or more N=235

Another significant trend, as shown in Figure 7.3, was that physicians aged above 50 required mainly educational information while younger physicians primarily expressed an “immediate need” for medical information. ($p < 0.05$) A possible explanation for this finding might be that younger physicians have a higher need to fill daily, immediate gaps of knowledge which older physicians can solve using their experience.

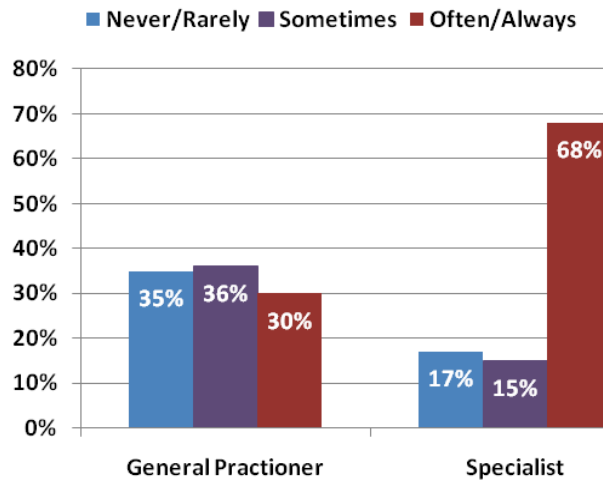
Figure 7.4 How much time can physicians devote to complex questions?



With regard to the question “how much time physicians can devote to complex questions”, an interesting finding was, as shown in Figure 7.4, that general practitioners were more time constrained than specialists. The majority (60%) of general practitioners can devote 20 minutes or less to complex questions. In contrast to that almost 60% of specialists reported that they devote more than 20 minutes to complex queries. Physicians in training appear to be either time constrained or willing to spend a lot of time for complex questions. As much as a quarter of physicians in training report that they would spend 40 minutes or more on complex queries.

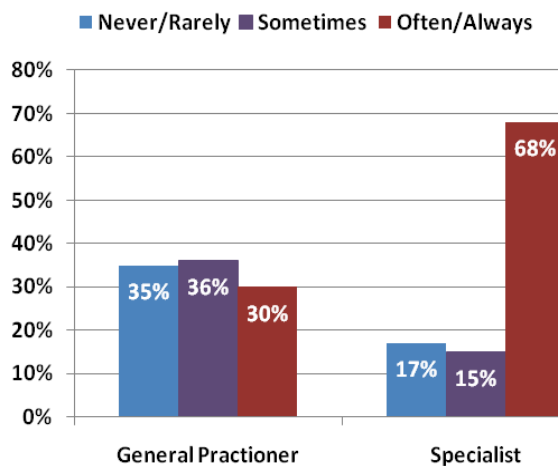
6.7.2 Resources

Figure 7.5 Frequency of use of Medical databases*



* Differences between groups are significant $p < 0.05$

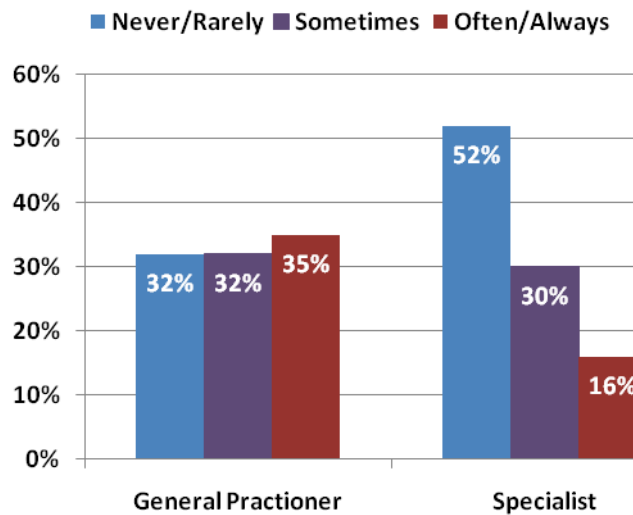
Figure 7.6a Frequency of use of Society websites*



* Differences between groups are significant $p < 0.05$

As illustrated in Figures 7.5 and 7.6a specialists were more likely to use society websites ($p < 0.05$) and medical research databases such as Pubmed ($p < 0.05$) than general practitioners.

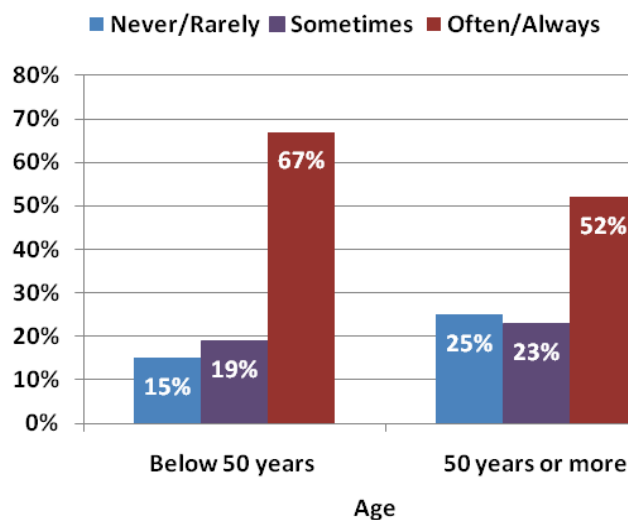
Figure 7.6b Frequency of general health related websites*



* Differences between groups are significant $p > 0.05$

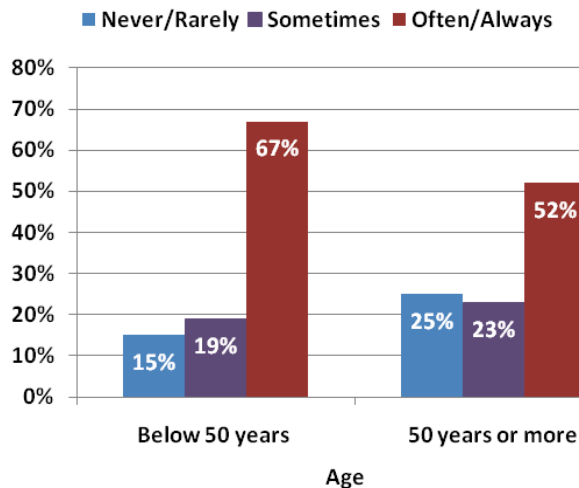
As shown in Figure 7.6b, general practitioners were more likely ($p < 0.05$) to access general health related websites than specialists.

Figure 7.7 Frequency of medical research databases



* Differences between groups are significant $p > 0.05$

Figure 7.8 Frequency of point-of-care evidence based medical databases

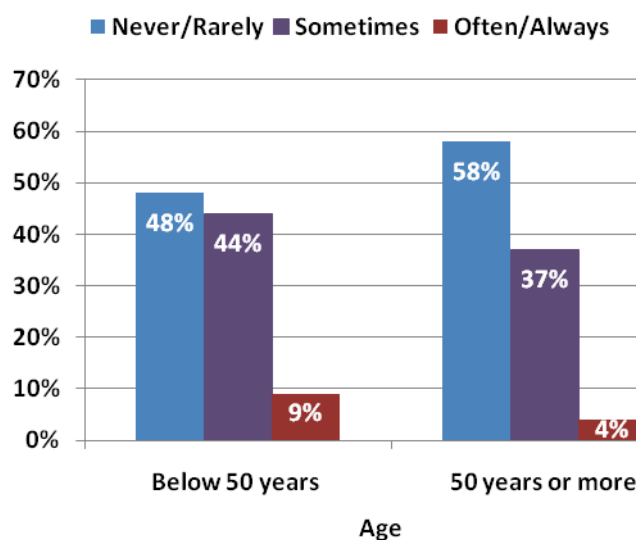


* Differences between groups are significant $p > 0.05$

Another interesting finding as shown in Figure 7.7 was that although older physicians (aged 50 or above) reported mainly an educational need they were less likely to look in medical research databases or point-of care data bases (see Figure 7.8) for information than younger physicians. ($p > 0.05$).

6.7.3 Impact of online information on medical decision making

Figure 7.9 Impact of online information on changing a patients medication*

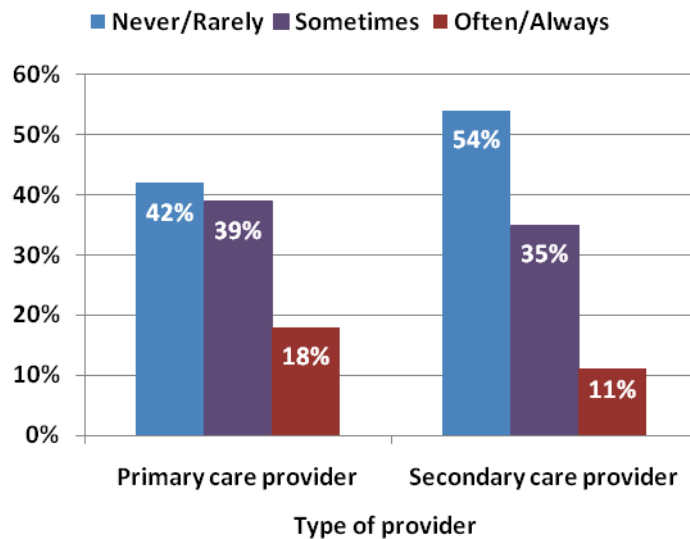


* Differences between groups are significant $p > 0.05$

D8.1.2 Requirements for the health professional search

It was found that compared to the younger group, physicians aged 50 years or more were less likely ($p>0.05$) to change a patients medication as a consequence of obtaining respective information online (Figure 7.9)

Figure 7.10 Impact of online information on willingness to print out patient information *

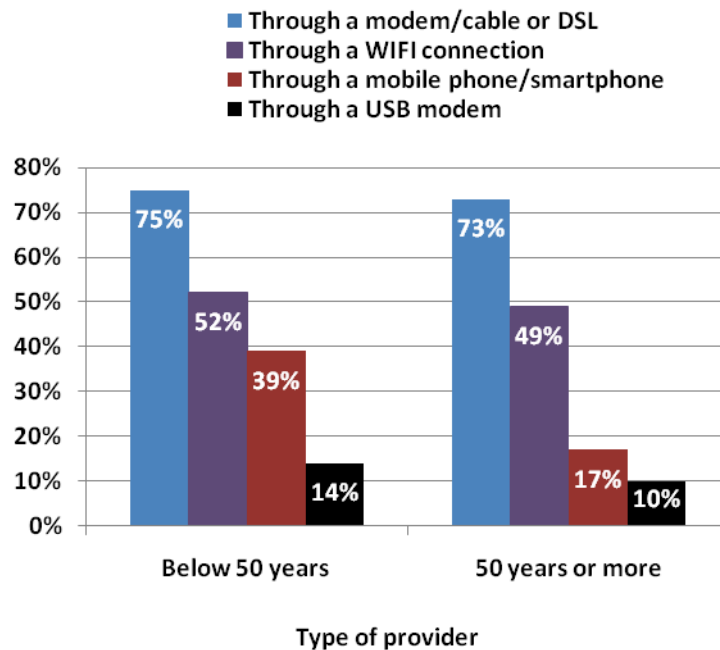


* Differences between groups are significant $p>0.05$

As illustrated in Figure 7.11, primary care providers were significantly ($p> 0.05$) more likely to print out information or suggest a website to patients when compared to secondary providers. An explanation for this finding may be that primary care providers have frequent direct patient contact, may consequently be more patient orientated and therefore more likely to directly help the patient with online information.

6.7.4 Internet access

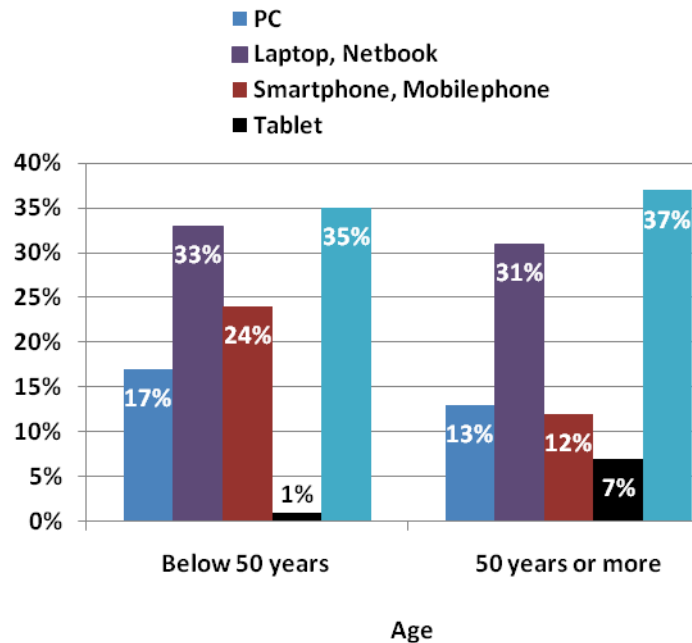
Figure 7.11 Comparison of use of devices to connect to the Internet by physician age*



* Differences between groups are significant $p > 0.05$
Question: How do you connect to the Internet?

Younger physicians were more likely to connect to the Internet using a mobile device ($p > 0.05$). Figure 7.11 illustrates that there were twice as much younger mobile internet users (red-colored bar) than older internet users. An interesting significant phenomenon was that that older physicians were more likely to use tablets in situations where younger people used smart phones.

Figure 7.12 Device most frequently used during a meeting/colloquium*



* Differences between groups are significant $p > 0.05$

As illustrated in Figure 7.12, younger physicians were significantly more likely to use a Smartphone than older physicians, during meetings/colloquiums. In contrast, in the same situation, older physicians were more likely than younger physicians to use a Tablet. A possible explanation could be that older physicians might find it easier to handle a tablet as it is easier to read (bigger writing) are more similar to previous solutions than the smart phone. While both groups placed equal priority in using the Laptop or PC in this situation, that younger physicians are more mobile in their overall internet access. As a consequence, younger physicians show higher access rates in “mobile situations” than older physicians

7 Discussion

The present survey was designed to examine the information needs and search behavior and preferences of health professionals in order to help develop an effective medical search engine in the context of KHRESMOI. Our findings supplement but also build on previous findings and illustrate a good picture of the user requirements of physicians. In the following section we discuss our results in light of previous literature and marked in bold are possible implications towards KHRESMOI

7.1 Internet access and use of mobile devices

Our findings indicate higher levels of Internet access and experience among physicians than previous studies (48). A possible explanation for this may be in part due to the fact that the questionnaire was disseminated and filled out electronically. However, such a bias was not considered a problem as the medical search engine by KHRESMOI is primarily targeted at internet savvy physicians. The fact that only 27% of the total sample connected to the Internet using a mobile device could have been due to a higher proportion of older physicians taking part in the study. Amongst the younger physicians (below 50) the use of mobile devices was significantly higher. Over two thirds of physicians access the Internet during a medical consultation and to do so they primarily use the PC or Laptop. As much as 70% accessed the Internet during a meeting/colloquium and 80% while travelling. The PC is the most commonly used device at work, while the Laptop dominates at home, during travelling and during meetings. Mobile devices are primarily used during travelling and during meetings. Awareness and use of physician society communities was low and of those who used them the most popular communities cited were doctors.net and doc2doc.

Internet use among physicians is high, and the use of mobile devices to access the internet is increasing.

7.2 Medical information need

In line with previous research, our findings highlight that physicians primarily require immediate information at “point-of-care” as well as wanting to pursue medical updating (i.e. educational need) (10). The so-called “non-intermediate” need defined as the situation where the physician has up to two days to thoroughly research a medical question is less prevalent. Thus, it appears that information is either required in a format in which it can be used „immediately” so quickly accessed, relevant, specific, concise and patient-orientated (=immediate need) or in a format that provides sufficient depth, complexity and educational value to advance existing medical knowledge (=educational need).

Congruent with previous research, (61, 62) important “informational needs” were drug information, information about condition and treatment. In addition, our results place a somewhat higher importance on the requirement of clinical trial information than past findings (61). When looking for drug information, physicians reported primarily looking for side effects, drug interaction, contraindication and information about drug dosage.

The “immediate need” at “point-of-care” as well as the need to pursue medical updating (educational need) were found to be important requirements of physicians. Information on drugs, disease descriptions, treatment and clinical trial information are dominant needs.

7.3 What are the consequences of obtaining online information ?

In contrast to some previous findings (5) our findings suggest that consequences of online research were mainly research related rather than directly affecting medical care. The reported impact on medical decision making was moderate. Still 7% report changing a patients treatment/therapy often and 35% sometimes, as a consequence of obtaining information online. 13% ask a colleague as result of online research, fitting in with previous findings on the importance of the colleague as a potential source for psychological affirmation. A possible explanation for the trend towards doing “further” research after obtaining online information could be a mistrust in the quality of aquired information to be suitable for a direct patient impact. Most of the previous research suggesting high direct impact of the Internet on patient care have been carried out in the United States. Thus, the contradiction with previous findings could either be a difference in the European population being more skeptical towards internet information or an underreporting of actual behaviour.

Information obtained online has a moderate impact on medical decision making and is often verified by other resources. (e.g. colleague)

7.4 Which online resources are used ?

In line with past research (65, 49) generic search engines (e.g. Google) and medical research databases (e.g. Pubmed) were the most frequently used online resources to obtain medical information. In addition, to previous findings Wikipedia played an important role. Current solutions of “specialised search engines” were rated as relatively unpopular suggesting their failure in adressing physican needs appropriately. Interesting was the high ranking of society websites.

Generic search engines (e.g. Google), medical research databases (e.g. Pubmed) and Wikipedia were the most popular resources while specialised search engines were unpopular.

7.5 How much time do physicans devote to searching for medical information?

The majority of physicans reported that they can devote 10-20 minutes or more to an important medical question. This is quite high when compared to previous literature. However, perhaps the concept of “time” needs to be considered together with other factors such as urgency, the belief that the answer exists.(10) and type of work and general circumstances. Some physicans may under given circumstances and availability of appropriate resources “make time” for complex queries.

Although physicans are time-constrained they are prepared to devote time to complex queries.

7.6 How do physicians search ?

Our results suggest that physicians look for condition rather than symptoms and prefer to type in keywords rather than questions. In addition, clicked first on the link which appeared most relevant and checked second and third pages of results during their search.

Physicians primarily search using keywords, approach the problem from its condition and check for the most relevant link on second and third pages.

7.7 Use of advanced search options

It was found that the most commonly used advanced search options were: Date range and language. Date range suggests that physicians place importance on information being up-to-date. The prominence of language could be an indirect indication that language as a barrier (only 5% stated it as a barrier) is present but merely underreported at direct questioning. Perhaps there was an overestimation of self-competence in English language and unawareness on language as a barrier. An alternative explanation could be that physicians may have a distinct preference of acquiring information in their mother tongue.

An interesting finding was that almost a third of the participants reported that they do not use advanced search options. Similarly “advanced search option” received a low ranking of importance when asked question 6.1 (What characteristics do you find important for a search engine?) However, when participants were asked about what they consider important tools for a search engine, “advanced search” was quoted as one of the most important tools. A possible explanation may be that physicians look for an “advanced search” of some form but are not completely satisfied with the “advanced search options” offered in current solutions.

The most popular advanced search options were date range and language.

7.8 Use of restriction criteria and assessment of quality

Congruent with the finding that physicians have the need to pursue medical updating (educational need) and commonly used medical research databases as a source of information, the most popular restriction criteria mentioned were “Journals”. Moderate importance was placed on the restricting information on basis of available books. In addition to that “The Source” of the information was viewed as being an important restriction criterion and also perceived as an important marker when determining the quality of information output. The source attributes used evaluate the quality of information were type of author and type of publisher. Additional important quality markers were how current information published was as well as the existence of references to the original source.

The source of obtained information was rated to be the most important restriction and quality criteria. The date of publication and reference to original resources were also highly rated criteria.

7.9 What are the problems with current solutions ?

The majority physicians reported that they occasionally face situations where they cannot find required information on the Internet. The main reason quoted was that they lacked the time to scan through a vast amount of irrelevant information. Consequently participants stated that the biggest barrier to online searching was the difficulty of finding relevant information in a given time constraint. A smaller but not negligible proportion indicated that they simply could not formulate their problem. An open-answer analysis suggested that there were some who believed the answer didn’t exist, some who thought that their query was too specific or complex and others who believed that the answer was only available in inaccessible databases. In addition to that, physicians view the information output as too general and mistrusted the quality of information obtained. Known barriers to medical information retrieval such as perceived lack of quality, relevance, inaccessibility, questionable trustworthiness or inadequate information due to being either too general (generic search engine) or too specific (evidence-based databases) are confirmed by our findings (19). As a consequence of failing to find the answer after the first search, as much as 9% aborted their search in the internet, while the rest pursued another more specific search.

Physicians often fail to find required information online. Inaccessibility of relevant information and the belief that the answers to their (complex, specific, specialized) questions do not exist in the Internet was seen as the biggest problem to searching online.

7.10 The ideal search engine

When asked about preferences towards an ideal medical search engine participants placed the highest importance on relevance, accessibility and trustworthiness of search results and preferred to categorize search results by author and type of content. Most physicians preferred around 5-10 search results on one page and believed that the most important medium for the presentation of medical information is print, image and to some degree video format. The well documented role of the colleague (27, 28) was confirmed by the finding that physicians rated the tool that enabled them to rate and perceive quality ratings of other physicians as most important. Other tools that regarded as important were: advanced search, a list of popular websites, possibility to choose between content filters, suggested relevant topic, search of images, medical calculators, integration of patient data within the search process, possibility to view search history and use from mobile platforms. The additional answers provided by physicians emphasise the importance of free access but restriction to medical professionals. It appears that physicians want their own secured space in the Internet in which they can inform themselves and communicate with colleagues

Physicians prefer a simple layout with 5-10 research results per page, primarily seek information in the form text and image and seek colleague feedback and affirmation during their search. A number of popular tools and advanced search options (language, date range) and restriction criteria (journals, source and books) and the visibility of popular markers of quality (author, publisher, and publication date) are crucial. The possibility for physicians to rate information and perceive ratings of colleagues, the connection to the patient record and a more developed form of “advanced search” could add a touch of relevant “novelty” to KHRESMOI.

7.11 Analysis : Differences across age and medical specialization

7.11.1 Research orientated (Secondary provider and specialists) vs. Patient orientated (General practitioner and primary care providers) physicians

Our results indicate a difference in « need » and search behaviour between the research based specialists and the patient-orientated general practitioners. It was found that general practitioners were more likely to consult general health websites and devoted in most cases no more than 20 minutes to complex questions. On the other hand specialists were more likely seek information on clinical trials, medical education for which they preferably consulted medical databases and society websites and almost a third were willing to spend over 30 minutes for solving complex queries.

Primary care providers were more likely to print out online information and adjust treatment as a consequence of obtaining online information. Secondary providers as a group, were even more research based in choice of resources and needs than specialists

General practitioners are more likely to use general health websites while specialists prefer to search in medical databases and society websites. Specialists are willing to spend more time to complex queries.

7.11.2 The impact of age on internet access, medical information need and use of online resources

Younger physicians, predominantly expressed “immediate needs” while older physicians mainly expressed an “educational need”. Younger physicians were more likely to consult appropriate resources (medical research databases and point-of-care databases) to pursue medical updating, than older physicians who primarily consulted society websites. During meetings, among the mobile users, younger physicians were more likely to use a smart phone while older physicians primarily used tablets. These results are interesting and could be explained with the notion that older physicians may have less need to fill daily knowledge gaps and still hold onto the classical concepts in which “societies” were the main sources of information. Another reason may be that older physicians are possibly less adept at searching through online journals than younger physicians.

Younger physicians most frequently required quick information at « point-of-care » while older physicians were mainly concerned with keeping existing knowledge up-to-date. On the other hand younger physicians were most likely to consult appropriate online resources (medical research databases and point-of-care databases) to pursue medical updating.

Younger physicians most frequently required medical information immediately and consulted online scientific resources. In contrast older physicians were more concerned with keeping existing knowledge up-to-date and most frequently consulted society websites. Mobile devices were predominantly used by younger physicians.

8 Implications and Conclusion

8.1 Implications towards KHRESMOI : A proposed list of user requirements

List of requirements towards an ideal medical search engine: On basis of the findings mentioned in the previous paragraphs we propose the following list of requirements towards a medical search engine tailored to the needs of physicians: Factors were listed if the median rating was “important” or “very important” or overall use was either highly ranked or above 25%.

Content

- Drug information,
- Information about condition
- Information about treatment
- Medical education and conferences
- Clinical trial information.
- **Subsection** on drug information including: side effects, contraindications, drug dosage, and drug description
- **High Accessibility** to specialized resources, medical research databases, wikipedia, society websites, hospital and university websites, targeted/specialized websites.

Tools:

- The possibility to rate information and view ratings of other physicians
- Advanced search

D8.1.2 Requirements for the health professional search

- List of popular websites
- Possibility to choose between content filters
- Suggested relevant topic
- Search of images
- Medical calculators
- Integration of patient data within the search process
- Possibility to view search history
- Use from mobile platforms

Search and filter options

- **Advanced search options:** Date range, language
- **Categorization of content:** Journals, books, author, type of organization, type of target audience (e.g. GP vs. Specialist), relevance and date of publication.
- **Search bar:** input of queries as keywords
- **Display of search results:** 5-10 results displayed
- Good link description

Other requirements:

- Quick accessibility of content
- High quality: recent publication date and professional source (i.e. author, publisher), possibility to rate and view ratings by other physicians
- Placement of advertisements is tolerated to keep a search engine free.
- Search engine should be free of charge but restricted to physicians
- Simple interface
- Presentation of medical information as text, image and video
- Multilingual access
- Differentiated approach of “need”: Addressing the need at “point of care” and the need to pursue medical updating on two separate levels (see below)

Towards a differentiated approach of need:

A differentiated approach in terms of what need (i.e. immediate vs. educational) a user has could be helpful in designing an efficient user-orientated interface, addressing the needs of all « types » of physicians. While on some parts it is possible to see a general trend (e.g. use of search engines, preference of drug information, searching by condition) among “physicians” as a whole, in other parts a dominant trend of partially variable user requirements between young and old as well as general practitioners and specialist becomes apparent. In order to address this difference appropriately a search engine would need to address the need at “point of care” and the need to pursue medical updating on two separate levels. In the former case, quick, concise, definitional information is required while the latter is more likely to ask for highly specialized, complex information. Perhaps an interface providing “immediate” answers for simple queries whilst providing the possibility to pursue to high quality, specialized advanced links is what is required.

8.2 Conclusion

Our survey helped us to obtain better understanding on how European physicians use the Internet to find medical information by allowing us to identify their needs and search preferences. According to our knowledge, it is the first large-scale, quantitative study on information needs, search behavior and preferences of physicians in Europe. The results highlight the requirement for a free medical search engine giving orientation in quality and relevance of highly accessible search results. The results suggest that medical professionals prefer a categorization on the basis of source, relevance and date of publication. In addition the integration of proposed tools, quality ranked information, as well as a differentiated approach towards different concepts of need may be what could make KHRESMOI an efficient medical search engine.

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11 Appendix

11.1 Full Physician Questionnaire

| [EN](#) | [FR](#) | [DE](#) | [SP](#) |

How do you search for health-related information on the Internet?
Target audience - Physicians and final year medical students

- The survey has been designed for medical doctors (in training or qualified) of all specialties.
- The questionnaire was developed by the [Society of Physicians in Vienna](#) in collaboration with the [Health on the Net Foundation](#), within the framework of the [European Project KHRESMOI](#) - project 2010-2014.
- Your participation will enable a better understanding on how medical doctors search for online medical information and help identify problems with current solutions. The results of the survey will contribute to the creation of a new medical search engine, adjusted to the requirements of medical doctors.
- The survey takes about 20 minutes to complete.
- All information collected is used exclusively for the purpose of the study and will be kept confidential. We do not collect personally identifiable information without your consent. More information on the [Confidentiality](#) and data privacy usage.
- There will be free online access to results after the completion of the survey.
- Contributions from around the world are welcome.



Society of Physicians in Vienna
in collaboration with the HON
Foundation in Geneva,
Switzerland, for khresmoi

[Promote our survey](#)

Are you a physician or final year medical student ?

- ☐ Yes
- ☐ No

Proceed

Part 1: Internet Access

1.1 How long have you been using the Internet?

- a) Less than 1 year
- b) 1-5 years
- c) 5-9 years
- d) 10-14 years
- e) 15 years or more

1.2 Do you currently have regular Internet access?

- a) Yes
- b) No

1.3 How often do you connect to the Internet?

- a) Daily
- b) Few times a week
- c) Once a week
- d) Few times a month
- e) Once a month or less

1.4 How do you connect to the Internet?

(Multiple answers possible)

- a) Through a modem / cable or DSL
- b) Through a Wi-Fi connection
- c) Through a USB modem
- d) Through a mobile phone
- e) Other please, specify
- f) Do not know

1.5 Which device(s) do you use to connect to Internet?

(Multiple answers possible)

- a) PC at home or in office
- b) Laptop/Net book
- c) Mobile phone
- d) Smartphone (e.g. iPhone, Blackberry, Asus, LG etc.)
- e) Tablets (iPad, Samsung Galaxy, Android 2.1 Tablet PC, Fly touch 1, View sonic View pad etc.
- f) Other : _____ (please specify)

1.6 How often do you access the Internet during a medical visit/ patient consultation?

- a) Never
- b) Rarely

D8.1.2 Requirements for the health professional search

- c) Sometimes
- d) Often
- e) Always
- f) I never see patients

1.7 What is the device you use the most to access medical information/do medical updating on the Internet, in the following situations?

- **During a consultation with a patient**
 - a) PC
 - b) Laptop, Netbook
 - c) Smartphone (e.g. iPhone, Blackberry, Asus)
 - d) Tablet (e.g. iPad, Samsung Galaxy)
 - e) I never access medical information/do medical updating in this situation
 - f) Other (please specify)
- **At work without a patient**
 - g) PC
 - h) Laptop, Netbook
 - i) Smartphone (e.g. iPhone, Blackberry, Asus)
 - j) Tablet (e.g. iPad, Samsung Galaxy)
 - k) I never access medical information/do medical updating in this situation
 - l) Other (please specify)
- **During a colloquium or meeting**
 - a) PC
 - b) Laptop, Netbook
 - c) Smartphone (e.g. iPhone, Blackberry, Asus)
 - d) Tablet (e.g. iPad, Samsung Galaxy)
 - e) I never access medical information/do medical updating in this situation
 - f) Other (please specify)
- **During a conference and while travelling**
 - a) PC
 - b) Laptop, Netbook
 - c) Smartphone (e.g. iPhone, Blackberry, Asus)
 - d) Tablet (e.g. iPad, Samsung Galaxy)
 - e) I never access medical information/do medical updating in this situation
 - f) Other (please specify)

- **At home**
 - a) PC
 - b) Laptop, Netbook
 - c) Smartphone (e.g. iPhone, Blackberry, Asus)
 - d) Tablet (e.g. iPad, Samsung Galaxy)
 - e) I never access medical information/do medical updating in this situation
 - f) Other (please specify)

1.8 Do you access or take part in online physician network communities? (e.g. doc2doc, medting, medext)

- a) Yes, I access _____ (Please specify)
- b) No
- c) I have never heard of such communities

Part 2 Medical Information Need

2.1 What kind of medical information do you look for as part of your daily practice?

- a) Answering possibilities: Never, Rarely, Sometimes, Often, Always
- b) Abbreviations/Definitions
- c) Diagnostic aid
- d) Disease descriptions
- e) Treatment specific information
- f) Drug information
- g) Prevention
- h) Causes and risk factors
- i) Clinical trial information/scientific literature
- j) Patient resources: Information/leaflets for patients (e.g. support groups)
- k) Job/Career opportunities
- l) Medical equipment
- m) Information about other institutions /doctors for referral
- n) Medical education/Conferences
- o) Other : _____ (please specify)

2.2 What kind of drug related information do you look for as part of your daily practice?

Multiple Answers possible

- a) Drug description
- b) Drug side effects
- c) Drug interactions
- d) Contraindications
- e) Drug safety, toxicity
- f) Drug dosage
- g) Drug prices
- h) New medication/Medication in development

2.3 How often can you identify the following informational needs during your daily practice?

Answering possibilities: Never, Rarely, Sometimes, Often, Always

- a) Immediate need (requiring an answer within 10 minutes)
- b) Non-immediate need (requiring an answer within 2 days)
- c) Educational/long-term needs (filling knowledge gaps and updating)

Part 3 Information Resources

3.1 How do you prefer to do medical updating and fulfill your educational requirements?

Multiple answers possible

- a) Complete online CME (Continuous Medical Education)
- b) Online Seminars/Webinars
- c) Read online journals/E-books/physician magazines
- d) Read printed journals/physician magazines/books
- e) Attend educational conferences/seminars
- f) Attend supplementary medical educational courses
- g) Other: _____ (Please specify)

3.2 How often do you use the following types of online sources to find online medical information?

Answering possibilities: Never, Rarely, Sometimes, Often, Always

- a) General search engines (Google, Yahoo, MSN etc.)
- b) Wikipedia
- c) General health related websites
- d) Pharmaceutical company websites
- e) Hospital or University websites
- f) Medical research databases (e.g. Pub med, Cochrane Library)
- g) Specialized medical search tool (e.g. HON Select, Yottalook)
- h) Point-of-Care/evidence-based medical databases (e.g. UpToDate, Best Practice)
- i) Targeted/area specialized websites
- j) Society websites (e.g. Society of Physicians, Medical Council)
- k) Web sites suggested by a colleague
- l) Physician network communities
- m) Medical forums/Blogs
- n) Other _____ (Please specify)

3.3 How often do you usually carry out the following actions as a result of obtaining clinical information online?

Answering possibilities: Never, Rarely, Sometimes, Often, Always

- a) Change a patient's medication
- b) Modify a patient's treatment/therapy
- c) Print out information for the patient or recommend a website to the patient
- d) Recommend to a patient a behavior change of habits (e.g. lifestyle)
- e) Recommend further tests based on symptoms
- f) Ask a colleague for his/her opinion
- g) Request more information about a product or medication

D8.1.2 Requirements for the health professional search

- h) Conduct further research using other resources
- i) Other : _____(please specify)

Part 4 Search Behavior

4.1 How much time can you/are you willing to spend on trying to find the answer to an important complex clinical question? (Answer required within two days)

- a) Less than 10 min
- b) 10-20 minutes
- c) 20-30 minutes
- d) 30-40 minutes
- e) More than 40 minutes

4.2 How do you usually phrase your search when using an online search engine?

- a) In question format (i.e. "What is the link between X and Y?")
- b) Using single key words (i.e. " X, Y, Link)
- c) Other please, specify _____

4.3 What do you usually first type into the search bar when you want to find out more about a medical problem?

- a) The Diagnosis (e.g. heart disease)
- b) The Symptom (e.g. chest pain)
- c) Other (Please, specify)

4.4 Which advanced search options do you mainly use when searching for medical information?

Multiple answers possible

- a) Date range
- b) Country
- c) Language
- d) Document format (pdf, doc, ppt)
- e) Other please, specify
- f) I do not use advanced search options

4.5 Which restriction criteria do you use when searching for medical information?

Multiple answers possible

- a) Image
- b) Video
- c) Type of Source (e.g. medical professional/layperson, University/private institution)
- d) News
- e) Books
- f) Journals
- g) Automatic Translation of results
- h) Blogs

D8.1.2 Requirements for the health professional search

- i) Other: _____ (Please specify)
- j) I do not use restriction criteria

4.6 When search results (list of links) appear, where do you usually click first?

- a) On the first link
- b) On the link which appears to have the most trustworthy source
- c) On the link which looks most relevant
- d) Other: _____ (Please specify)

4.7 How often do you check the second or third page of results?

- a) Never
- b) Rarely
- c) Sometimes
- d) Often
- e) Always

4.8 How often do you use the following criteria to rate the quality of the information you retrieve from the Internet?

Answering possibilities: Never, Rarely, Sometimes, Often, Always

- a) Author (e.g. medical professional vs. lay person)
- b) Publisher/Institution (University vs. health organization, Thieme vs. Elsevier)
- c) Time of last update
- d) References to the original source

4.9 How often do you face situations where you cannot find the answer to a medical question in the Internet?

- a) Never
- b) Rarely
- c) Sometimes
- d) Often
- e) Always

4.10 What is the most common reason you failed to find an answer?

- a) Too many search results, too difficult /time-consuming to choose what is relevant
- b) I was not sure how to formulate the search query
- c) Other _____ Please, specify _____

4.11 What do you usually do when you search for a medical problem on the Internet and the relevant answer does not show up?

Multiple answers possible

- a) Do another search using search terms that get MORE SPECIFIC
- b) Do another search using search terms that get LESS SPECIFIC
- c) Nothing, I stop searching on the Internet

D8.1.2 Requirements for the health professional search

- d) I send an E-mail/Skype/Chat with a colleague
- e) I post the question in a medical forum/physician community website
- f) Other_____ (Please, specify)

Part 5 Barriers

5.1 What difficulties do you face when searching for medical, health and prescription information on the internet?

Multiple answers possible

- a) Slow internet connection
 - b) Time consuming to find relevant information
 - c) Search results are too general
 - d) Search results are too specific
 - e) Questionable trustworthiness
 - f) “Restricted accessibility” to good quality information (e.g. membership or subscription required)
 - g) Absence of good quality filter/rating
 - h) Lack of Usability for smart phones and mobile devices
 - i) Distracting advertisements
 - j) Language Barrier: Insufficient medical information in my mother tongue
- Other_____ (Please specify)

Part 6 Expectation/Ideal Search Engine

6.1 How many search results do you prefer to be displayed on a page?

- a) No more than five
- b) Between five and ten
- c) Ten and twenty
- d) More than twenty

6.2 Please, choose how you prefer the search results to be categorized?

Multiple answers possible

- a) Type of author (health professional / non health professional)
- b) Type of target audience (general public, patients, and health professionals)
- c) Type of content (articles vs. blogs and forums)
- d) Quality accreditation marks (HONcode, URAC, WMA etc)
- e) Type of organization (Hospital, Pharmaceutical Company, University, Insurance Company, Government)
- f) Other : _____ (Please specify)

6.3 How important do you rate the following media formats for the presentation of medical information? Answering possibilities: Unimportant, of little importance, moderately important, important, very important

- a) Video
- b) Audio
- c) Text and Graphic (Image, picture)

6.4 How important do you rate the following tools? Answering possibilities: unimportant, of little importance, moderately important, important, very important

- a) Advanced search (country, language, date range)
- b) Automatic translation
- c) Suggested relevant topics
- d) Spelling correction
- e) Automatic completion of query
- f) Search of images
- g) FAQ -how to use the search engine
- h) Word cloud representing the most prevalent words across the search results by a search engine
- i) Sharing your search results with your colleague, patient or friend (by email)
- j) Receiving updates of your search results by email/RSS
- k) Ability to listen to the text and save it as mp3
- l) Accessibility for impaired users
- m) Audio and video podcast

D8.1.2 Requirements for the health professional search

- n) Use from mobile platforms
- o) Possibility to view search history
- p) Medical calculators
- q) Being able to quality rate information/websites and perceiving the ratings of other physicians
- r) Integration of patient data within the search process as a diagnostic aid for complex cases
- s) Possibility to store self-made compendiums
- t) Possibility to choose between content filters (disease description, drugs information)
- u) A list of “popular” websites (i.e. where most users have found the answer to medical query)
- v) Other: _____ (Please specify)

6.7 Would you prefer....?

- a) To have ads in order to keep a search service free
- b) To donate and avoid advertisement placement
- c) pay fee-for-service each time you use the search engine (Please, indicate how much per query (Euro))
- d) To subscribe to a membership subscription (Please, indicate how much per month (Euro))

6.8 Please describe any other ideas/suggestions towards an ideal medical search engine or tool helping you find medical information on the internet.

Part 7: Tell us about yourself

7.1 Your age

- a) 20-29
- b) 30-39
- c) 40-49
- d) 50-59
- e) 60-69
- f) 70-79
- g) ≥ 80

7.2 Gender

- a) Male
- b) Female

7.3 Where do you live and work?

- a) I live and work in urban area
- b) I live and work in rural area
- c) I live in rural area and work in urban
- d) I live in urban area and work in rural

7.4 What is your highest completed academic degree?

- a) I am a medical student and have not completed my degree yet
- b) Medical degree
- c) Medical degree plus Master
- d) Medical degree plus PhD
- e) Medical degree plus Professorship/Habilitation
- f) Other _____ please specify

7.5 Do you currently work as a physician?

- a) Yes, I work as a qualified general practitioner
- b) Yes, I work as a qualified specialist
- c) Yes, but I am a specialist/general practitioner in training
- d) No, I am currently unemployed / retired
- e) No, I work in another field
- f) Other : _____ (please specify)

7.6 How long have you worked as a qualified (i.e. completed medical degree) physician?

- a) Less than 12 months
- b) 1-3 years
- c) 4-6 years
- d) 7- 9 years

D8.1.2 Requirements for the health professional search

- e) 10-20 years
- f) More than 20 years
- g) I am a final year medical student
- h) I have completed my medical degree, but have not worked as a physician
- i) Other_____ (Please specify)

7.7 Where do you work? (Please refer to your main job)?

- a) I am self-employed
- b) I work in a public healthcare service
- c) I work in a private healthcare service
- d) I work in a university medical healthcare service
- e) I am unemployed
- f) I am retired
- g) Other

7.8 How many patients do you consult on average per (working) day?

- a) I never consult patients
- b) Below 20
- c) 20-40
- d) 41-60
- e) More than 60
- f) Other : _____ (Please specify)

7.9 What is your main specialization?

- a) Anesthesiology and Critical Care Medicine
- b) Dermatology
- c) Emergency Medicine
- d) General Practice
- e) Child- and Adolescent Medicine
- f) Internal Medicine
- g) Pulmonary Disease
- h) Neurology/Psychiatry
- i) Obstetrics and Gynecology
- j) Ophthalmology
- k) Orthopedics and orthopedic. Surgery
- l) Otolaryngology (Nose, Ear, Throat)
- m) Physical Medicine and Rehabilitation
- n) Surgery
- o) Urology

D8.1.2 Requirements for the health professional search

- p) Orthodontist and Dental Medicine
- q) Radiology
- r) Research and Education_____ (Please specify main field)
- s) Others_____ (Please specify)
- t) I am a physician in training_____ (Please specify field)

7.11 Country

- Albania
- Austria
- Belgium
- Bulgaria
- Bosnia
- Canada
- China
- Croatia
- Cyprus
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Iceland
- India
- Ireland
- Israel
- Italy
- Kosovo
- Latvia
- Lichtenstein
- Lithuania
- Luxembourg
- Macedonia
- Malta

D8.1.2 Requirements for the health professional search

- Montenegro
- Netherlands
- Norway
- Poland
- Portugal
- Romania
- Russia
- Serbia
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland
- The UK
- The USA
- Turkey
- Other please, specify

7.12 Mother tongue

- Albanian
- Arabic
- Bosnian
- Bulgarian
- Chinese
- Croatian
- Czech
- Danish
- Dutch
- English
- Estonian
- Finnish
- French
- German
- Greek
- Hindi/Urdu

D8.1.2 Requirements for the health professional search

- Hungarian
- Icelandic
- Irish
- Italian
- Japanese
- Latvian
- Lithuanian
- Luxembourgish
- Macedonian
- Malay
- Maltese
- Norwegian
- Polish
- Portuguese
- Romanian
- Russian
- Serbian
- Slovakian
- Slovene
- Spanish
- Swahili
- Swedish
- Turkish
- Other

7.13 How well do you understand medical English?

- a) English is my mother tongue
- b) Excellent
- c) Very well
- d) Well
- e) Average
- f) Poor

7.14 Please indicate in the following field the Homepage of your Internet browser (Internet Explorer, Firefox, Safari and Opera): _____

Please indicate the page in the format: www.homepage.com

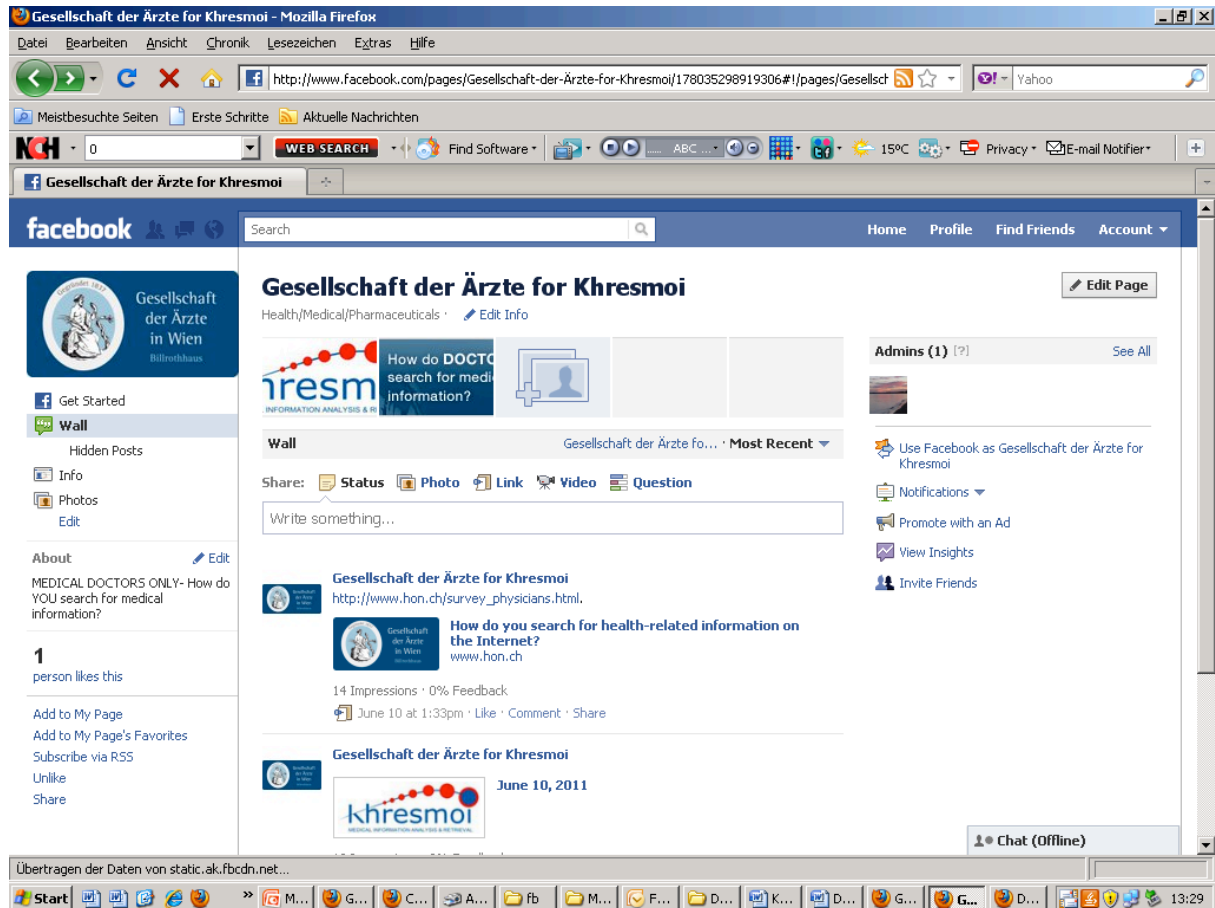
D8.1.2 Requirements for the health professional search

7.15 The data you have provided is confidential. If you are willing to be contacted for follow up studies or would like to be informed of results please give us your E-Mail address:

- a) Yes, my E-Mail address is _____
- b) No

THANK YOU FOR YOUR PARTICIPATION!

11.2 Screenshot of promotion



11.3 Data Tables

Distribution of demographic characteristics

		Count	% within valid Sample(a)
Gender (N=434)	Male	273	62,9%
	Female	161	37,1%
Age (N=434)	20-29	23	5,3%
	30-39	73	16,8%
	40-49	99	22,8%
	50-59	156	35,9%

D8.1.2 Requirements for the health professional search

	60-69	65	15,0%
	70-79	14	3,2%
	80 and above	4	,9%
Country (N=447)	Austria	194	43,4%
	Switzerland	139	31,1%
	United Kingdom	37	8,3%
	Germany	18	4,0%
	France	15	3,4%
	Other	44	9,8%
Mothertongue (N=435)	German	202	46,4%
	French	135	31,0%
	English	38	8,7%
	Spanish	13	3,0%
	Italian	11	2,5%
	Greek	8	1,8%
	Portugese	6	1,4%
	Other	22	5,1%
Language of questionnaire filled out (N=560)	German	269	48,0%
	English	102	18,2%
	French	177	31,6%
	Spanish	12	2,1%
Where do you live and work? (N=431)	I live and work in an urban area	325	75,4%
	I live and work in a rural area	37	8,6%
	I live in a rural area and work in an urban area	45	10,4%

D8.1.2 Requirements for the health professional search

	I live in an urban area and work in a rural area	24	5,6%
What is your highest completed academic degree? (N=435)	I am a Medical Student and have not completed my degree yet	4	,9%
	Medical Degree	188	43,2%
	Medical Degree plus Master	49	11,3%
	Medical Degree plus PhD	131	30,1%
	Medical Degree plus Professorship/Habilitation	54	12,4%
	Other	9	2,1%
Medical Specialisation (N=434)	Internal Medicine	99	22,8%
	General Practice	70	16,1%
	Neurology/Psychiatry	33	7,6%
	Urology	25	5,8%
	Child and Adolescent Medicine	22	5,1%
	Anesthesiology and Critical Care Medicine	22	5,1%
	Obstetrics and Gynecology	17	3,9%
	Radiology	18	4,1%
	Orthodontist and Dental Medicine	10	2,3%
	Other	64	14,7%
	I am a physician in training	54	12,4%
Work experience as a physician? (N=432)	Less than 12 months	7	1,6%
	1-3 years	19	4,4%
	4-6 years	28	6,5%
	7-9 years	27	6,3%

D8.1.2 Requirements for the health professional search

	10-20 years	103	23,8%
	More than 20 years	238	55,1%
	I am a student and have not yet completed my Medical Degree	4	,9%
	I have completed my Medical Degree but have not worked as a	1	,2%
	Other	5	1,2%
Where do you work? (N=431)	I am self-employed	162	37,4%
	I work in a public healthcare service	143	33,0%
	I work in a private healthcare service	31	7,2%
	I work in a university medical healthcare service	67	15,5%
	I am unemployed	3	,7%
	I am retired	15	3,5%
	Other	12	2,8%
Do you currently work as a physician? (N=435)	Yes, I work as a qualified general practitioner	85	19,5%
	Yes, I work as a qualified specialist	264	60,7%
	Yes, but I am in a specialist/general practitioner training	54	12,4%
	No, I am currently unemployed/retired	15	3,4%
	No, I work in another field	15	3,4%
	Other	2	,5%
Type of Provider (N=434)	Primary provider	201	46,3%
	Secondary provider	151	34,8%

D8.1.2 Requirements for the health professional search

	Research and Education	8	1,8%
	Other	20	4,6%
	Physician in Training	54	12,4%
How many patients do you consult on average per (working) day? (N=441)	I never consult patients	54	12,2%
	Below 20	197	44,7%
	20-40	140	31,7%
	41-60	26	5,9%
	More than 60	24	5,4%
How well do you understand medical English? (N=433)	English is my mother tongue	38	8,8%
	Excellent	135	31,2%
	Very Well	131	30,3%
	Well	85	19,6%
	Average	37	8,5%
	Below Average	5	1,2%
	Poor	1	,2%
	I don't understand any English	1	,2%

a Valid Sample = Sample excluding missing data

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	273	48,8	62,9	62,9
	Female	161	28,8	37,1	100,0
	Total	434	77,5	100,0	
Missing	System	126	22,5		
Total		560	100,0		

D8.1.2 Requirements for the health professional search

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-29	23	4,1	5,3	5,3
	30-39	73	13,0	16,8	22,1
	40-49	99	17,7	22,8	44,9
	50-59	156	27,9	35,9	80,9
	60-69	65	11,6	15,0	95,9
	70-79	14	2,5	3,2	99,1
	80 and above	4	,7	,9	100,0
	Total	434	77,5	100,0	
Missing	System	126	22,5		
Total		560	100,0		

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 50	195	34,8	44,9	44,9
	50 or above	239	42,7	55,1	100,0
	Total	434	77,5	100,0	
Missing	System	126	22,5		
Total		560	100,0		

Country

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Austria	194	34,6	43,4	43,4
	Switzerland	139	24,8	31,1	74,5
	United	37	6,6	8,3	82,8

D8.1.2 Requirements for the health professional search

Kingdom					
	Germany	18	3,2	4,0	86,8
	France	15	2,7	3,4	90,2
	Greece	8	1,4	1,8	91,9
	Italy	8	1,4	1,8	93,7
	Spain	6	1,1	1,3	95,1
	USA	6	1,1	1,3	96,4
	Brazil	6	1,1	1,3	97,8
	Croatia	1	,2	,2	98,0
	Denmark	1	,2	,2	98,2
	Finland	1	,2	,2	98,4
	Romania	1	,2	,2	98,7
	Sweden	1	,2	,2	98,9
	Syria	1	,2	,2	99,1
	New Zealand	1	,2	,2	99,3
	Mexico	1	,2	,2	99,6
	Peru	1	,2	,2	99,8
	Cuba	1	,2	,2	100,0
	Total	447	79,8	100,0	
Missing	System	113	20,2		
Total		560	100,0		

Country (shortened)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Austria	194	34,6	43,4	43,4
	Switzerland	139	24,8	31,1	74,5

D8.1.2 Requirements for the health professional search

	United Kingdom	37	6,6	8,3	82,8
	Germany	18	3,2	4,0	86,8
	France	15	2,7	3,4	90,2
	Greece	8	1,4	1,8	91,9
	Italy	8	1,4	1,8	93,7
	Brazil	6	1,1	1,3	95,1
	Spain	6	1,1	1,3	96,4
	USA	6	1,1	1,3	97,8
	Other	10	1,8	2,2	100,0
	Total	447	79,8	100,0	
Missing	System	113	20,2		
Total		560	100,0		

Language

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	German	269	48,0	48,0	48,0
	English	102	18,2	18,2	66,3
	French	177	31,6	31,6	97,9
	Spanish	12	2,1	2,1	100,0
	Total	560	100,0	100,0	

Mother tongue

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	German	202	36,1	46,4	46,4
	French	135	24,1	31,0	77,5
	English	38	6,8	8,7	86,2

D8.1.2 Requirements for the health professional search

Spanish	13	2,3	3,0	89,2
Italian	11	2,0	2,5	91,7
Greek	8	1,4	1,8	93,6
Portuguese	6	1,1	1,4	94,9
Other	22*	3,9	5,1	100,0
Total	435	77,7	100,0	
Missing System	125	22,3		
Total	560	100,0		

* Languages in the category „Other“ are: Arabic (n=1), Bulgarian (n=2), Croatian (n=2), Czech (n=1), Danish (n=1), Dutch (n=1), Finish (n=1), Hindi/Urdu (n=1), Hungarian (n=1), Italian (n=8), Maltese (n=1), Portuguese (n=6), Romanian (n=1), Serbian (n=1), Swedish (n=3), Turkish (n=1), Other (n=5- no further specification was given)

How well do you understand medical English?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	English is my mother tongue	38	6,8	8,8	8,8
	Excellent	135	24,1	31,2	40,0
	Very Well	131	23,4	30,3	70,2
	Well	85	15,2	19,6	89,8
	Average	37	6,6	8,5	98,4
	Below Average	5	,9	1,2	99,5
	Poor	1	,2	,2	99,8
	I don't understand any English	1	,2	,2	100,0
	Total	433	77,3	100,0	
Missing System		127	22,7		
Total		560	100,0		

Where do you live and work?

D8.1.2 Requirements for the health professional search

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I live and work in an urban area	325	58,0	75,4	75,4
	I live and work in a rural area	37	6,6	8,6	84,0
	I live in a rural area and work in an urban area	45	8,0	10,4	94,4
	I live in an urban area and work in a rural area	24	4,3	5,6	100,0
	Total	431	77,0	100,0	
Missing	System	129	23,0		
Total		560	100,0		

What is your highest completed academic degree?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I am a Medical Student and have not completed my degree yet	4	,7	,9	,9
	Medical Degree	188	33,6	43,2	44,1
	Medical Degree plus Master	49	8,8	11,3	55,4
	Medical Degree plus PhD	131	23,4	30,1	85,5
	Medical Degree plus Professorship/Habilitation	54	9,6	12,4	97,9
	Other	9	1,6	2,1	100,0
	Total	435	77,7	100,0	
Missing	System	125	22,3		
Total		560	100,0		

D8.1.2 Requirements for the health professional search

Do you currently work as a physician?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, I work as a qualified general practitioner	85	15,2	19,5	19,5
	Yes, I work as a qualified specialist	264	47,1	60,7	80,2
	Yes, but I am in a specialist/general practitioner training	54	9,6	12,4	92,6
	No, I am currently unemployed/retired	15	2,7	3,4	96,1
	No, I work in another field	15	2,7	3,4	99,5
	Other	2	,4	,5	100,0
	Total	435	77,7	100,0	
Missing	System	125	22,3		
Total		560	100,0		

How long have you worked as a qualified physician?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 12 months	7	1,3	1,6	1,6
	1-3 years	19	3,4	4,4	6,0
	4-6 years	28	5,0	6,5	12,5
	7-9 years	27	4,8	6,3	18,8
	10-20 years	103	18,4	23,8	42,6
	More than 20 years	238	42,5	55,1	97,7
	I am a student and have not yet completed my Medical Degree	4	,7	,9	98,6

D8.1.2 Requirements for the health professional search

	I have completed my Medical Degree but have not worked as a	1	,2	,2	98,8
	Other	5	,9	1,2	100,0
	Total	432	77,1	100,0	
Missing	System	128	22,9		
Total		560	100,0		

Where do you work?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I am self-employed	162	28,9	37,4	37,4
	I work in a public healthcare service	143	25,5	33,0	70,4
	I work in a private healthcare service	31	5,5	7,2	77,6
	I work in a university medical healthcare service	67	12,0	15,5	93,1
	I am unemployed	3	,5	,7	93,8
	I am retired	15	2,7	3,5	97,2
	Other	12	2,1	2,8	100,0
	Total	433	77,3	100,0	
Missing	System	127	22,7		
Total		560	100,0		

What is your main specialization?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Internal Medicine*	99	17,7	22,8	22,8
	General Practice	70	12,5	16,1	38,9

D8.1.2 Requirements for the health professional search

Neurology/Psychiatry	33	5,9	7,6	46,5
Urology	25	4,5	5,8	52,3
Child and Adolescent Medicine	22	3,9	5,1	57,4
Anesthesiology and Critical Care Medicine**	22	3,9	5,1	62,4
Obstetrics and Gynecology	17	3,0	3,9	66,4
Radiology	18	3,2	4,1	70,5
Orthodontist and Dental Medicine	10	1,8	2,3	72,8
Other***	64	11,4	14,7	87,6
I am a physician in training	54	9,6	12,4	100,0
Total	434	77,5	100,0	
Missing System	126	22,5		
Total	560	100,0		

* including Pulmonary medicine (n=8)

** including Emergency medicine (n=1)

*** The category „Other „included also categories where n<10:

Dermatology (n=5)

Emergency Medicine (n=1)

Ophthalmology (n=5)

Otolaryngology (n= 4)

Physical Medicine and Rehabilitation (n=2)

Nuclear Medicine (n=2)

Diagnostic Laboratory Medicine (n=5)

Dermatology (n=5)

Physical Medicine and Rehabilitation (n=4)

Surgery (n=3)

Orthopedics and Orthopedic surgery (n=7)

Research and Education (n=8)

D8.1.2 Requirements for the health professional search

Other (n=20) was undefined

Type of provider

	Frequency	Percent	Valid Percent	Cumulative Percent
Primary provider	208	37,1	47,9	47,9
Secondary provider	144	25,7	33,2	81,1
Research and Education	8	1,4	1,8	82,9
Other	20	3,6	4,6	87,6
Physician Training in	54	9,6	12,4	100,0
Total	434	77,5	100,0	
Missing System	126	22,5		
Total	560	100,0		

* Other: No further specification was given

* **Includes the following specialties:** Internal medicine (n=99), General practice (n=70), Obstetrics and Gynecology (n=17) and Child and Adolescent medicine (n=22)

** **Includes the following specialties:** Neurology/psychiatry, Urology, Anesthesiology and Critical Care Medicine, Radiology, Orthodontist and Dental Medicine, Dermatology (n=5)

Emergency Medicine (n=1), Ophthalmology (n=5), Otolaryngology (n= 4), Physical Medicine and Rehabilitation (n=2), Nuclear Medicine (n=2), Diagnostic Laboratory Medicine (n=5)

Dermatology (n=5), Physical Medicine and Rehabilitation (n=4)

How many patients do you consult on average per (working) day?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid I never consult	54	9,6	12,2	12,2
Below 20	197	35,2	44,7	56,9
20-40	140	25,0	31,7	88,7
41-60	26	4,6	5,9	94,6
More than 60	24	4,3	5,4	100,0

D8.1.2 Requirements for the health professional search

Total	441	78,8	100,0
Missing System	119	21,3	
Total	560	100,0	

How long have you been using the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 5 years	24*	4,3	4,3	4,3
	5-9 years	78	13,9	14,0	18,2
	10-14 years	233	41,6	41,7	59,9
	15 years or more	224	40,0	40,1	100,0
	Total	559	99,8	100,0	
Missing	System	1	,2		
Total		560	100,0		

* Including the response "Less than one year" (n=2)

Do you currently have regular Internet access?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	552	98,6	98,9	98,9
	No	6	1,1	1,1	100,0
	Total	558	99,6	100,0	
Missing	System	2	,4		
Total		560	100,0		

How often do you connect to the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Daily	510	91,1	91,7	91,7

D8.1.2 Requirements for the health professional search

	Few times a week	41	7,3	7,4	99,1
	Once a week	1	,2	,2	99,3
	Once a month or less	4	,7	,7	100,0
	Total	556	99,3	100,0	
Missing	System	4	,7		
Total		560	100,0		

How do you connect to the Internet?*

		Number of Responses	Percent of Responses (N=923)	Percent of Valid Cases (N=557)
	Modem/cable or DSL	404	43,8	72,5
	WIFI connection	276	29,9	49,6
	USB modem	71	7,7	12,7
	Mobilephone/smartphone	151	16,4	27,1
	I don't know	8	,9	1,4
	Total	923 (responses)	100,0	165,7
Missing	Cases			3
Valid	Cases			557

* Based on a sample where N=557 and multiple answers (N=923) were allowed

How often do you access the Internet during a medical visit/patient consultation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	115	20,5	20,6	20,6
	Rarely	121	21,6	21,7	42,3
	Sometimes	155	27,7	27,8	70,1
	Often	109	19,5	19,5	89,6
	Always	22	3,9	3,9	93,5
	I never see patients	36	6,4	6,5	100,0
	Total	558	99,6	100,0	

D8.1.2 Requirements for the health professional search

Missing	System	2	,4
Total		560	100,0

What is the device you use the most to access medical information/do medical updating on the Internet, during a consultation with a patient?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PC	256	45,7	53,6	53,6
	Laptop, Net book	65	11,6	13,6	67,2
	Smartphone, Mobile phone	28	5,0	5,9	73,0
	Tablet	10	1,8	2,1	75,1
	I never access medical information in this situation	115	20,5	24,1	99,2
	Other	4	,7	,8	100,0
	Total	478	85,4	100,0	
Missing	System	82	14,6		
Total		560	100,0		

What is the device you use the most to access medical information/do medical updating on the Internet, during a colloquium or meeting?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PC	77	13,8	16,0	16,0
	Laptop, Net book	150	26,8	31,3	47,3
	Smartphone, Mobile phone	84	15,0	17,5	64,8
	Tablet	20	3,6	4,2	69,0
	I never access medical	146	26,1	30,4	99,4

D8.1.2 Requirements for the health professional search

information in this situation				
Other		3	,5	,6
Total		480	85,7	100,0
Missing	System	80	14,3	
Total		560	100,0	

What is the device you use the most to access medical information/do medical updating on the Internet, at work without a patient?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid PC	359	64,1	69,3	69,3
Laptop, Net book	129	23,0	24,9	94,2
Smartphone, Mobile phone	10	1,8	1,9	96,1
Tablet	8	1,4	1,5	97,7
I never access medical information in this situation	10	1,8	1,9	99,6
Other	2	,4	,4	100,0
Total	518	92,5	100,0	
Missing System	42	7,5		
Total	560	100,0		

D8.1.2 Requirements for the health professional search

What is the device you use the most to access medical information/do medical updating on the Internet, during a conference/while travelling?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PC	14	2,5	2,9	2,9
	Laptop, Netbook	198	35,4	40,7	43,6
	Smartphone, Mobilephone	144	25,7	29,6	73,3
	Tablet	30	5,4	6,2	79,4
	I never access medical information in this situation	96	17,1	19,8	99,2
	Other	4	,7	,8	100,0
	Total	486	86,8	100,0	
Missing	System	74	13,2		
Total		560	100,0		

Do you access or take part in online physican network communities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	98	17,5	17,7	17,7
	No	305	54,5	55,2	72,9
	I have never heard of such communities	150	26,8	27,1	100,0
	Total	553	98,8	100,0	
Missing	System	7	1,3		
Total		560	100,0		

D8.1.2 Requirements for the health professional search

Please specify which physician society communities you access?*

		Frequency	Percent of cases	Percent of responses
Valid	doctors.net	9	10,0	11,5
	doc2doc	9	8,0	8,9
	Colliquio	7	7,0	7,8
	doccheck	7	6,0	6,7
	Medscape	5	5,0	5,6
	Univadis	3	3,0	3,3
	HIN (Health Info)	3	5,0	5,6
	Dermarena	2	2,2	2,6
	Facharzt.de	2	2,2	2,6
	UoToDate	2	2,2	2,6
	Sermo	1	1,1	1,3
	Other	42	46,7	53,8
	Total	78	86,1	100,0
	Missing	12	13,9	15,40
Total		90	100,0	115,40

* Category "Other" includes all responses where (n<2): ERS (European Respiratory Society, Access Medicine, Allgemeinmedizinische E-mailseite in Deutschland (GP E-mail newsletter of Germany), AMICOR, ProCOR, SDOH, EQ/PAHO, Ante Minnie, Billrothhaus, CATAL, DNUK, BMJ, Finish Medical Network, FMH, Gyndoc, Forum de Psychiatres (Yahoo), Gasnet, heart.org, intramed.net, anaesthesia.org, medbook, medromands, mgclinique, MIR, Nephro-mailinglist, ECwusers, spanmed, vivu, turnusarzt.at, sbgenitoscopia brazil, quantiaMD, MMT, fulmedico, medtext

** Based on a sample of physicians stating that they access physician society communities (N=98) and who gave further details to which community they access (N=78). Multiple answers were considered.

D8.1.2 Requirements for the health professional search

Descriptive Table: What kind of medical information do you look for in your daily practice?

	N		Mean	Median
	Valid	Missing		
Disease descriptions	499	61	3,08	3 (Sometimes)
Treatment specific information	498	62	3,28	3 (Sometimes)
Drug information	503	57	3,59	4 (Often)
Prevention	496	64	2,44	2 (Rarely)
Cause and Risk factors	491	69	2,78	3 (Sometimes)
Clinical Trial Information	496	64	3,50	4 (Often)
Patient resources: Information/leaflets for patients (e.g. support groups)	493	67	2,40	2 (Rarely)
Job/Career opportunities	496	64	1,79	1 (Never)
Medical equipment	492	68	2,21	2 (Rarely)
Information about other Institutions/doctors for referral	493	67	2,48	2 (Rarely)
Medical Education/Conferences	497	63	3,35	3 (Sometimes)

What drug information do you look for in your daily practice?*

	Count	% of Responses (N=2188)	% of Cases (N=487)
Drug description	292	13,3%	60,0%
Side effects	380	17,4%	78,0%
Drug interactions	363	16,6%	74,5%
Contraindications	330	15,1%	67,8%
Drug safety	242	11,1%	49,7%
Drug dosage	314	14,4%	64,5%
Drug prices	146	6,7%	30,0%
New medication/Medication in development	107	4,9%	22,0%
Total responses	2188	100,0%	
Missing	73		
Total cases	487		449,3%

* Multiple answers were permitted

D8.1.2 Requirements for the health professional search

How often do you use the following types of online sources to find online medical information?

	N	Mean	Std. Deviation	Median
General Search Engine	480	4,00	,869	4 (Often)
Medical research databases (Pubmed, Cochrane Library)	473	3,56	1,201	4 (Often)
Wikipedia	465	3,11	1,050	3 (Sometimes)
Society Websites (e.g. Society of Physicians, Medical Council)	471	3,06	1,026	3 (Sometimes)
Hospital or University websites	468	2,92	1,020	3 (Sometimes)
Targeted/Area specialized websites	464	2,90	1,033	3 (Sometimes)
General health related websites	465	2,58	1,031	3 (Sometimes)
Websites suggested by a colleague	463	2,47	,920	2 (Rarely)
Point-of-Care/Evidence-based medical databases (e.g. UpToDate, Bestpractice)	471	2,37	1,315	2 (Rarely)
Pharmaceutical company websites	468	2,12	,922	2 (Rarely)
Physician network communities	466	1,76	1,012	1 (Never)
Medical Forums/Blogs	460	1,65	,910	1 (Never)
Specialized medical search tool	462	1,62	,932	1 (Never)
Valid N (listwise)	55			

D8.1.2 Requirements for the health professional search

How often do you usually carry out the following actions as a result of obtaining clinical information online?

	N	Mean	Std. Deviation	Median
	Statistic	Statistic	Statistic	Statistic
Conduct further research using other resources	460	2,93	,987	3 (Sometimes)
Request more information about a product or medication	460	2,57	,973	3 (Sometimes)
Modify a patient's treatment/therapy	464	2,48	,802	3 (Sometimes)
Ask a colleague for his/her opinion	463	2,47	,960	3 (Sometimes)
Print out information for the patient or recommend a website to the patient	462	2,43	,996	2 (Rarely)
Recommend further tests based on symptoms	463	2,41	,933	2 (Rarely)
Change patient's medication	465	2,37	,836	2 (Rarely)
Recommend to a patient a behaviour change of habits (e.g. lifestyle)	460	2,33	,959	2 (Rarely)

How often do you use the following criteria to rate the quality of the information you retrieve from the Internet?

	N	Mean	Std.	Median	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Author	444	3,66	1,055	4 (Often)	-,658	,116
Publisher	448	3,66	1,061	4 (Often)	-,770	,115
Time of last update	438	3,51	1,045	4 (Often)	-,375	,117
References to original source	439	3,49	1,081	4 (Often)	-,475	,117
Valid listwise	415					

D8.1.2 Requirements for the health professional search

How often do you use the criteria "AUTHOR" to rate the quality of the information you retrieve from the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	18	3,2	4,1	4,1
	Rarely	46	8,2	10,4	14,4
	Sometimes	101	18,0	22,7	37,2
	Often	182	32,5	41,0	78,2
	Always	97	17,3	21,8	100,0
	Total	444	79,3	100,0	
Missing	System	116	20,7		
Total		560	100,0		

How often do you use the criteria "PUBLISHER" to rate the quality of the information you retrieve from the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	24	4,3	5,4	5,4
	Rarely	36	6,4	8,0	13,4
	Sometimes	103	18,4	23,0	36,4
	Often	192	34,3	42,9	79,2
	Always	93	16,6	20,8	100,0
	Total	448	80,0	100,0	
Missing	System	112	20,0		
Total		560	100,0		

How often do you use the criteria "TIME OF LAST UPDATE" to rate the quality of the information you retrieve from the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	15	2,7	3,4	3,4
	Rarely	61	10,9	13,9	17,4
	Sometimes	126	22,5	28,8	46,1
	Often	158	28,2	36,1	82,2
	Always	78	13,9	17,8	100,0
	Total	438	78,2	100,0	
Missing	System	122	21,8		
Total		560	100,0		

D8.1.2 Requirements for the health professional search

How often do you use the criteria "REFERENCES TO ORIGINAL SOURCE" to rate the quality of the information you retrieve from the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	23	4,1	5,2	5,2
	Rarely	54	9,6	12,3	17,5
	Sometimes	124	22,1	28,2	45,8
	Often	160	28,6	36,4	82,2
	Always	78	13,9	17,8	100,0
	Total	439	78,4	100,0	
Missing	System	121	21,6		
Total		560	100,0		

**How much time, can you or are you generally willing to, spend on trying to find the answer to an important complex clinical question?
(Answer required within two days)**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 10 min	59	10,5	12,8	12,8
	10-20 minutes	150	26,8	32,6	45,4
	20-30 minutes	110	19,6	23,9	69,3
	30-40 minutes	75	13,4	16,3	85,7
	More than 40 minutes	66	11,8	14,3	100,0
	Total	460	82,1	100,0	
Missing	System	100	17,9		
Total		560	100,0		

How often do you face situations where you cannot find the answer to a medical question in the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
	Never	15	2,7	3,3	3,3
	Rarely	173	30,9	37,9	41,1
	Sometimes	201	35,9	44,0	85,1
	Often	65	11,6	14,2	99,3
	Always	3	,5	,7	100,0
	Total	457	81,6	100,0	
Missing	System	103	18,4		
Total		560	100,0		

What is the most common reason you failed to find an answer?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Too many search results, too time-consuming to chose what is relevant	281	50,2	64,9	64,9
	I was not sure how to formulate the query	90	16,1	20,8	85,7
	Other	62	11,1	14,3	100,0
	Total	433	77,3	100,0	
Missing	System	127	22,7		
Total		560	100,0		

Reasons why physicians think that they fail to obtain the answer to a medical question on the internet (Open format question)*

		Frequency	Percent	Valid Percent	Cumulative Percent
	The question was too specific/specialised	14	2,5	22,6	22,6
	There is no answer	9	1,6	14,5	37,1
	The answer was inaccessible	9	1,6	14,5	51,6
	Lack of relevant results/sources	8	1,4	12,9	64,5
	The disease/question was too rare	5	,9	8,1	72,6
	The question was too complex	3	,5	4,8	77,4
	No data yet on new developments/no literature available	3	,5	4,8	82,3
	Poor design/search output of search engine	2	,4	3,2	85,5
	Problem is too practical/required the advice of an experienced specialist	2	,4	3,2	88,7
	Search output was too general	2	,4	3,2	91,9
	Too little search results	1	,2	1,6	93,5
	Search items do not lead to answer	1	,2	1,6	95,2
	Language barrier	1	,2	1,6	96,8
	Lack of time to pursue alternative sources	1	,2	1,6	98,4
	Lack of internet experience (Age 82)	1	,2	1,6	100,0
	Total	62	11,1	100,0	
Missing	System	498	88,9		
Total		560	100,0		

* Answers summarize the answers given by participants in the category "Other" (N=62)

D8.1.2 Requirements for the health professional search

What do you usually FIRST type into the search bar when you want to find out more about a medical problem?*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	The diagnosis	328	58,6	73,1	73,1
	The symptom	88	15,7	19,6	92,7
	Other	33	5,9	7,3	100,0
	Total	449	80,2	100,0	
Missing	System	111	19,8		
Total		560	100,0		

* The option "Other" included following answers: "I use both" (n=5), Depends on the situation/question (n=11), Treatment (n=1), Medication (n=2), problem orientated (n=1), combination of diagnosis and therapy (n=1)

How do you usually phrase your search when using an online search engine?*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	In question format	31	5,5	6,8	6,8
	Using single key words	417	74,5	91,6	98,5
	Other	7	1,3	1,5	100,0
	Total	455	81,3	100,0	
Missing	System	105	18,8		
Total		560	100,0		

* The answering option "Other" included participants answering "I use both", "full-text" (n=1)

D8.1.2 Requirements for the health professional search

What do you usually do when you search for a medical problem on the Internet and the relevant answer does not show up?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Do another search using search terms that get MORE SPECIFIC	263	47,0	59,5	59,5
	Do another search using search terms that get LESS SPECIFIC	83	14,8	18,8	78,3
	Nothing, I stop searching on the Internet	40	7,1	9,0	87,3
	I send an E-mai/Skype/Chat with a colleague*	34	6,1	7,7	95,0
	I post the question in a medical forum/physican community	11	2,0	2,5	97,5
	Other	11	2,0	2,5	100,0
	Total	442	78,9	100,0	
Missing	System	118	21,1		
Total		560	100,0		

* Includes participants stating that they "call" or "meet a colleague in person (n=8)

What do you do if the relevant answer does not show up? Please specify*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I get more OR less specific, depending on search output	8	1,4	53,3	53,3
	I use different search terms	2	,4	13,3	66,7
	I do a offline literature search	2	,4	13,3	80,0
	I arrange/bring up the topic in a meeting among colleagues	1	,2	6,7	86,7
	I look in a textbook	2	,4	13,3	100,0
	Total	15	2,7	100,0	
Missing	System	545	97,3		
Total		560	100,0		

* Including the open format answers of participants who stated "Other" (n=11) or participants adding extra information to their answer (n=4)

D8.1.2 Requirements for the health professional search

When search results (list of links) appear, where do you usually click first?

		Frequency	Percent	Valid Percent	Cumulative Percent
	The first link	17	3,0	3,7	3,7
	The link which appears to have the most trustworthy source	140	25,0	30,8	34,6
	The link which looks most relevant	295	52,7	65,0	99,6
	Other*	2	,4	,4	100,0
	Total	454	81,1	100,0	
Missing	System	106	18,9		
Total		560	100,0		

*The category "Other" includes following responses "I click on the most trustworthy AND relevant result" (n=1) and one undefined response

How often do you check the second or third page of results?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	5	,9	1,1	1,1
	Rarely	97	17,3	21,2	22,3
	Sometimes	143	25,5	31,3	53,6
	Often	172	30,7	37,6	91,2
	Always	40	7,1	8,8	100,0
	Total	457	81,6	100,0	
Missing	System	103	18,4		
Total		560	100,0		

How many search results do you prefer to be displayed on one page?

		Frequency	Percent	Valid Percent	Cumulative Percent
	No more than five	50	8,9	11,5	11,5
	Between five and ten	159	28,4	36,5	47,9
	Between ten and twenty	150	26,8	34,4	82,3
	More than twenty	77	13,8	17,7	100,0
	Total	436	77,9	100,0	
Missing	System	124	22,1		
Total		560	100,0		

D8.1.2 Requirements for the health professional search

Please chose how you prefer the search results to be categorized?*

	Number of responses (N=569)	% of sample (N=283)
Type of Author	123	43,50
Type of target audience	100	35,30
Type of content	142	50,20
Quality accreditation marks	92	32,50
Type of organization	106	37,50
Other**	6	2,10
Total	569	201,10

* % are based on a sample where N=283 and multiple responses (N=569) were permitted

** The category "Other" includes "no categorization" (n=2) and undefined (n=4)

How important do you rate the following media formats for the presentation of medical information?

	N		Mean	Median	Std. Deviation	Skewness	Std. Error of Skewness
	Valid	Missing					
Video	386	174	2,57	2,00	1,117	,340	,124
Audio	385	175	2,25	2,00	,979	,538	,124
Text and Image	311	249	4,27	5,00	1,195	-1,669	,138

D8.1.2 Requirements for the health professional search

Barriers to finding medical information online

	Number of responses	% of valid sample (N=434)
Search results are too specific	21	4,8
Language Barrier	21	4,8
Lack of usability for smart phones and mobile devices	53	12,2
Distracting advertisement	70	16,1
Questionable trustworthiness	102	23,5
Absence of good quality filter/rating	128	29,5
Search results are too general	143	32,9
Questionable trustworthiness	144	33,2
Time consuming to find relevant information	196	45,2
Time consuming to find relevant information	282	65,0
Total	1160	

D8.1.2 Requirements for the health professional search

How important are the following characteristics of a search engine to you? ^a

	N	Mean	Std. Deviation	Median
	Statistic	Statistic	Statistic	Statistic
Relevance of results	437	4,66	,597	5 (Very important)
Trustworthiness of results	437	4,48	,731	5 (Very important)
Readability of results	429	4,17	,767	4 (Important)
Speed	439	4,15	,813	4 (Important)
Quality of link description	427	4,09	,919	4 (Important)
Easy to use/Simplicity	434	4,09	,842	4 (Important)
Advanced options/filters	394	3,07	1,024	3 (Moderately important)
Usability for smart phones and mobile devices	418	2,77	1,242	3 (Moderately important)
Valid N (listwise)	378			

a. Based on the following scale: 1= Unimportant, 2= Of little importance, 3=Somewhat important, 4= Important, 5= Very important

Please choose how you prefer the search results to be categorized?

	Responses (N=569)	% of total sample (N=283)
Type of content	142	50,2%
Type of Author	123	43,5%
Type of organization	106	37,5%
Type of target audience	100	35,3%
Quality accreditation marks	92	32,5%
Other*	6	2,1%

* The category "Other" included the responses "No categorization" (n=1) and "None" (n=1)

How many results do you prefer to be displayed on one page?

		Frequency	Percent	Valid Percent	Cumulative Percent
	No more than five	50	8,9	11,5	11,5
	Between five and ten	159	28,4	36,5	47,9
	Between ten and twenty	150	26,8	34,4	82,3
	More than twenty	77	13,8	17,7	100,0
	Total	436	77,9	100,0	
Missing	System	124	22,1		
Total		560	100,0		

D8.1.2 Requirements for the health professional search

How important do you rate the following tools? ^a

	N	Mean	Std. Deviation	Mode
	Statistic	Statistic	Statistic	Statistic
Being able to quality rate information/websites and perceiving ratings of other physicians	414	2,39	,704	3 (Important)
How important do you rate the following tools? Advanced search	426	2,38	,614	2 (Neutral)
A list of popular websites (where most users have found the answer to a query)	407	2,31	,704	3 (Important)
Possibility to chose between content filters	411	2,29	,694	2 (Neutral)
Suggested relevant topics	417	2,25	,670	2 (Neutral)
Search of images	413	2,17	,682	2 (Neutral)
Medical calculators	409	2,13	,714	2 (Neutral)
Integration of patient data within the search process as a diagnostic aid for complex cases	412	2,11	,744	2 (Neutral)
Possibility to view search history	416	2,08	,728	2 (Neutral)
Use from mobile platforms	416	2,06	,780	2 (Neutral)
FAQ-How to use search engines	410	2,02	,690	2 (Neutral)
Automatic completion of query	413	2,01	,668	2 (Neutral)
Possibility to store self-made compendia	403	2,01	,768	2 (Neutral)
Word cloud	412	1,96	,712	2 (Neutral)
Spelling correction	419	1,84	,720	2 (Neutral)
Sharing your search results with your colleague, patient of friend	416	1,82	,716	2 (Neutral)
Receiving updates of your search results by E-mail/RSS	412	1,81	,718	2 (Neutral)
Automatic translation	425	1,73	,710	1 (Unimportant)
Accesibility for impaired users	416	1,71	,714	1 (Unimportant)
Audio and video podcast	411	1,60	,668	1 (Unimportant)
Ability to listen to the text and save it as mp3	412	1,50	,645	1 (Unimportant)

a. Based on the following scale: 1= Unimportant, 2= Neutral, 3 = Important

D8.1.2 Requirements for the health professional search

Would you prefer...?

		Frequency	Percent	Valid Percent	Cumulative Percent
	To have ads in order to keep a search service free	262	46,8	62,7	62,7
	To donate and avoid ads placement	53	9,5	12,7	75,4
	To pay fee-for-service each time you use the search engine	24	4,3	5,7	81,1
	To subscribe to a membership subscription	79	14,1	18,9	100,0
	Total	418	74,6	100,0	
Missing	System	142	25,4		
Total		560	100,0		

Frequency table: How much would you pay per query for a search engine?*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	,5	1	,2	3,7	3,7
	1,0	2	,4	7,4	11,1
	2,0	2	,4	7,4	18,5
	3,0	1	,2	3,7	22,2
	5,0	9	1,6	33,3	55,6
	8,0	1	,2	3,7	59,3
	10,0	6	1,1	22,2	81,5
	20,0	3	,5	11,1	92,6
	25,0	1	,2	3,7	96,3
	100,0	1	,2	3,7	100,0
	Total	27	4,8	100,0	
Missing	System	533	95,2		
Total		560	100,0		

* Means were not calculated for this data because level of distribution was not normal due to the small sample size