2009

Supporting Healthcare Knowledge Transfer through a Web 2.0 Portal - Insights from Austria

Katharina Steininger
Johannes Kepler University of Linz, katharina.steininger@jku.at

David Rueckel
Johannes Kepler University of Linz, david.rueckel@jku.at

Edwald Dannerer
St. Vinzenz Hospital Linz, edwald.dannerer@bhs.at

Friedrich Roithmayr
Johannes Kepler University of Linz, friedrich.roithmayr@jku.at

Supporting Healthcare Knowledge Transfer through a Web 2.0 Portal – Insights from Austria

Katharina Steininger
Johannes Kepler University Linz
katharina.steininger@jku.at

David Rückel
Johannes Kepler University Linz
david.rueckel@jku.at

Ewald Dannerer
St. Vinzenz Hospital Linz
ewald.dannerer@bhs.at

Friedrich Roithmayr
Johannes Kepler University Linz
friedrich.roithmayr@jku.at

ABSTRACT

The internet has become a source of huge amounts of information related to healthcare; some is useful while other information can be misleading and even dangerous. Since it is not easy to distinguish the quality of web contents, a portal hosted and maintained by medical experts can lead to more credibility. This article presents the results of a study conducted in Austria that investigates the patients' need for a web 2.0 knowledge transfer portal hosted and maintained by hospital doctors to provide high-quality information to its patients. The doctors' appraisals concerning their patients' demands as well as their willingness to participate in a web 2.0 health online portal by publishing information, by answering questions and supervising user generated contents are investigated. The survey was conducted online using two questionnaires, one for potential patients and one for hospital doctors of an Austrian central hospital. The results show that there is definitely great potential for a hospital to successfully establish a web 2.0 knowledge portal since the current quality of existing online health portals is not sufficient to meet the demands of at least one third of the polled patients.

Keywords

Knowledge Management, e-Health, Web 2.0, Healthcare Knowledge Transfer, Health 2.0.

INTRODUCTION

Patients are willing to play a more active role in the healthcare they receive. Information is available from multiple sources today, especially through the pervasion with information technology of one's daily life. The internet in general and websites like www.google.com or www.wikipedia.org in particular offer access to a broad spectrum on medical information. On the one hand potential patients actively use the internet as a source of information to get a better knowledge of diseases and their possible treatment. (Alkhateeb, Clauson, Khanfar and Latif, 2008; Dannecker and Lechner, 2007) In fact, the act of looking for health or medical information is one of the most popular activities on the internet. (Rosenberg, 2004) Patients' increasing demand for transparency in healthcare is obvious; they more and more prove to be so called patients 2.0. (Giustini, 2006) On the other hand the insufficient quality of not reviewed contents on websites is undisputable. Therefore it is a trendsetting knowledge management task for governments or healthcare institutions to support the transfer of expert knowledge to laities. Using the philosophy and technologies of the web 2.0 approach has turned out to be a very effective and successful way to create and share knowledge in a rich variety of domains e.g. education (Huang and Behara, 2007), research (Ullrich, Borau, Luo, Tan, Shen and Shen, 2008), development and maintenance of information technology (Benlian and Hess, 2008) or e-commerce (Wigand, Benjamin and Birkland 2008). Therefore the effort of trendsetting knowledge management in healthcare could be realized by the establishment of knowledge portals consistent with the web 2.0 philosophy.

The number of online portals providing health information to people, who account healthcare as part of their own responsibility is steadily increasing. There are different types of portals according to their purposes; some focus on providing information on diseases, treatments or medication (e.g. www.webmd.com, www.aolhealth.com, www.righthealth.com, www.healthline.com) while others try to create virtual communities by offering web 2.0 functions like rating of doctors, hospitals, or treatments, creation of blogs or discussion of health experiences (e.g. www.revolutionhealth.com, www.ratemds.com, www.patientslikeme.com).

This article describes a survey that was conducted to determine the need for a web 2.0 knowledge transfer portal hosted by a central hospital in Austria to provide high-quality information to its patients. Furthermore, the study aimed to find out whether doctors are willing to participate or even moderate such a portal to guarantee accuracy and reliability of the information.

Knowledge management in healthcare

One of the challenges of knowledge management in any complex social situation is to find out how knowledge is being created, manipulated and shared. Probst, Raub and Romhardt developed a concept of knowledge management by dividing the knowledge management process into eight elements that form a circuit: knowledge aims, knowledge identification, knowledge acquisition, knowledge manipulation, knowledge sharing, knowledge storing, knowledge usage, and knowledge rating. (Probst, Raub and Romhardt, 1999) Polanyi described the importance to distinguish explicit from tacit knowledge (Polanyi, 1958) and Nonaka developed a concept to transfer tacit into explicit knowledge (Nonaka, 1990). This is also relevant when being established within healthcare, as the success of knowledge management in general, and a knowledge management system in particular relies on the collective practice of (healthcare) professionals. (Gosh and Scott, 2008) Furthermore, the diffusion of medical knowledge through knowledge transfer is essential for the proper treatment of patients. (Lin, Tan and Chang, 2008)

Knowledge management and web 2.0

Web 2.0 can be defined as the adoption of open technologies to support the users' computing collaboration and participation through mechanisms like wikis, RSS, web services, blogs, forums and instant messages. (Ganesh and Padmanabhuni, 2007) Applications underlying the web 2.0 philosophy can be defined by attributes that are in brief: (O'Reilly, 2005)

- The Web as Platform;
- Harnessing Collective Intelligence;
- Data is the Next Intel Inside;
- End of the Software Release Cycle;
- Lightweight Programming Models;
- Software Above the Level of a Single Device;
- Rich User Experiences.

Web 2.0 is often associated with knowledge management, because informal knowledge can be found in web 2.0 applications (Richards, 2009), learning (gathering knowledge) can be supported by knowledge transfer (Yan, Yang and Wang, 2008) and knowledge exchange is emphasized (Ridings, 2003). Famous and partly health related examples of web 2.0 applications are www.wikipedia.org (wiki), RSS feeds on www.webmd.com or www.medicinenet.com (RSS), www.thehealthblog.com (blog), boards on www.webmd.com (forum) or www.icq.com (instant messages).

Web 2.0 and healthcare

In the field of healthcare the consideration of tacit knowledge is perhaps more important than in many other social settings since finding the right treatment can be very complex and unique to the patient. (Smith, 2000) Medical decisions often base on tacit knowledge gained from experiences, opinions, and the consideration of the unique patient history. (Perry, 2006) Web 2.0 is an effective instrument to share tacit knowledge, not only among doctors or between doctors and patients but also among patients themselves. Empirical evidences show that there are successful applications of web 2.0 in healthcare. Such applications can for example support doctors in decision making (Wright, Bates, Middleton, Hongsermeier, Kashyap, Thomas and Sittig, 2008) or assist patients forming up communities (Leimeister, Daum and Krcmar, 2002).

Web 2.0 knowledge transfer portal

Knowledge management is an effective strategy to capture, store, organize, and share knowledge within and across an organization and therefore suitable to manage health related information especially in the context of hospitals. There are various definitions of portals, reaching from single-point-access software systems to provide easy access to information and support knowledge worker (Mack, Ravin and Byrd, 2001) to one-stop solutions to the information problem created by the World Wide Web to increase the access to information in a specific domain (Kotorov and Hsu, 2001). We consider portals as knowledge management tools that can be useful to hospitals in accessing, creating and transferring knowledge via their online portals. (Lee, Goh and Chua, 2007) In our case, a web 2.0 knowledge transfer portal does not only provide health information created by experts but also offer web 2.0 functions like wikis, forums, chat rooms, or blogs. These functions shall allow patients and interested people to share their knowledge concerning diseases or treatments as well as experiences with a certain hospital in general or doctors in particular.

RESEARCH QUESTIONS

This study examines the need for a web 2.0 portal to support medical knowledge transfer from hospital doctors to its (potential) patients. It focuses on both the patients' and the doctors' point of view as well as on the willingness of doctors to participate in the creation of its contents. The following research questions were developed: (i) Do potential patients appreciate knowledge transfer via web 2.0 portals hosted by hospital doctors? (ii) Do doctors recognize the patients' need for a web 2.0 knowledge transfer portal and are they disposed to take part in the development of its content?

The first question seems worth mentioning because the demands of the target group have to be examined before successfully establishing a web 2.0 knowledge transfer portal in the field of healthcare. Patients' satisfaction with explanations by their attending doctor, habits of further information gathering, rating of online information credibility, and willingness to share personal experiences with other people concerned or interested in a certain disease or treatment are important factors that have to be examined before design and implementation can take place.

The examination of the doctors' attitude within the scope of question two can be of interest because their participation is one of the main success factors of an online health portal. Furthermore, doctors can benefit in several ways by offering the most important information on certain diseases, surgeries and medication relevant within one doctor's area of expertise. First, web 2.0 knowledge transfer can lead to reduced workload for doctors who do not need to explain common information to each patient individually but refer patients to the information provided on the portal. Second, the hospital in general and the specialist in particular can gain higher reputation by establishing transparency concerning medical care rather than keeping details in behind. Third, the hospital gets feedback on its treatments and has influence on patient-created contents by commenting or even correcting statements.

RESEARCH DESIGN

Following an exploratory approach (Bortz and Doering, 2006) a survey design was chosen in order to gather quantitative data. To answer the research questions a survey research design is best suitable to examine a phenomenon in a wide variety of natural settings (Pinsonneault and Kraemer, 1993) which is existent in this case. The survey was conducted online using two questionnaires, one for each of the groups within the sample to be interrogated. The first group of participants (questionnaire I) consists of potential patients living in the catchment area of a central hospital in Austria. 170 questionnaires were returned from these 500 randomly selected patients. This hospital offers almost 700 beds, treats 43.000 inpatients und 62.000 ambulant patients per year and employs 260 medical doctors within 19 units. (OEBIG, 2009; KHDBS, 2009) The second group of participants (questionnaire II) consists of medical doctors from this hospital. The questionnaire was answered by 72 hospital doctors out of the sample. Table 1 shows the details of the sample in brief.

	Questionnaire I	Questionnaire II
Survey type	Online survey	Online survey
Period	28th November 2008 – 31st December 2008	28th November 2008 – 31st December 2008
Sample description	Potential patients	Medical doctors
Sample type	Probability sample	Systematic sample
Sample size	500	260
Response	170	72
Response rate	34 percent	28 percent
Number of Questions	26	22

Table 1. Survey Details

Questionnaire I is organized in 26 questions covering the following subject areas:

- Demographic characteristics;
- Information on participants' internet usage;
- Satisfaction with medical information given by attending doctor;

- Information on the usage of web 2.0 knowledge portals;
- Willingness to publish personal experiences and personal health information;
- Willingness to participate in a knowledge portal according to the web 2.0 philosophy.

Figure 1 shows the relationship between the first research question and some examples of questions answered by potential patients. Questions concerning demographic characteristics and internet usage are not shown in Figure 1.

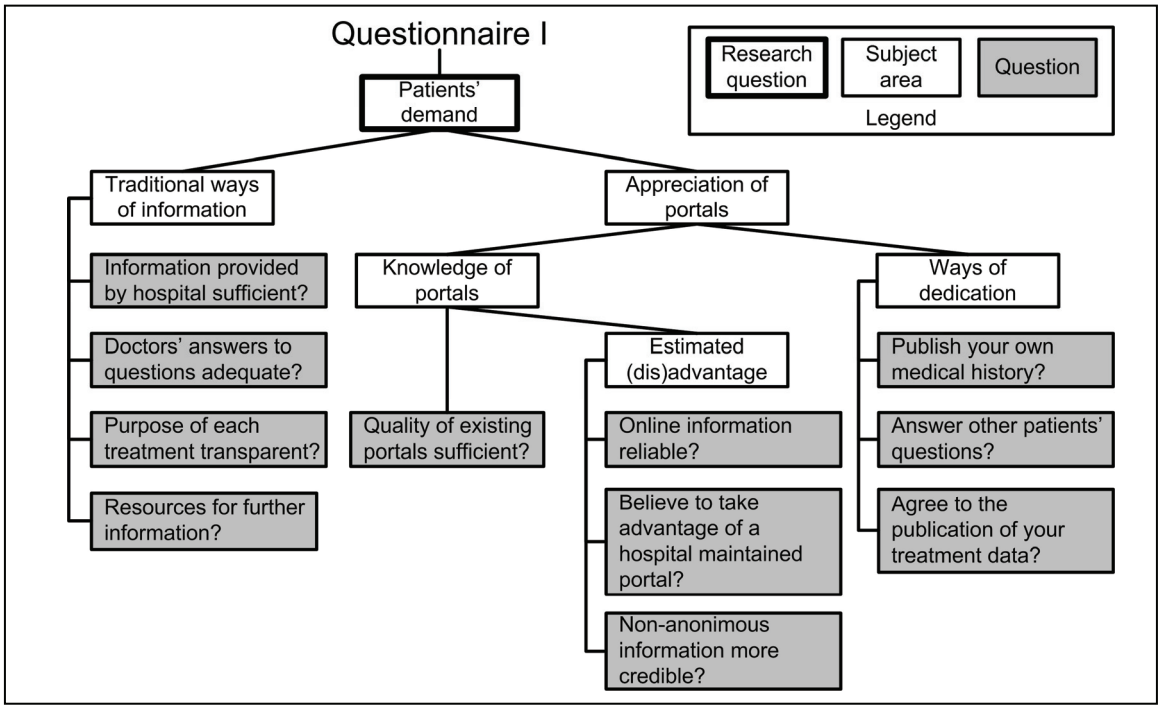

Figure 1. Relationship between research question (i) and questionnaire I

The participants of questionnaire I show the following demographic characteristics. 35 percent of the polled patients are female and the sample reveals an age distribution shown in Figure 3. All of the participants have been in hospital at least once for at least two days.

Due to the fact that in 2008 85 percent of the 16-24 year olds compared to just 19 percent of 65-74 year olds have internet access in Austria (Statistik Austria, 2009), it is coherent that most of the participants of questionnaire I (potential patients) are between 19 and 40 years old (91 percent). Furthermore, the potential users of a web 2.0 solution for healthcare knowledge transfer need internet access to benefit from this source of information and need to be used to the utilization of the internet as a source of information. Therefore this age bracket is suited for this survey.

Questionnaire II (medical doctors) was subdivided in 22 questions and featured the following subject areas:

- Demographic characteristics;
- Patients' knowledge on diseases and treatments;
- Knowledge on online health portals;
- Estimation of the acceptance of a hospital's web 2.0 knowledge portal;
- Readiness to support a hospital's online health portal.

The relationship between the second research question and examples of questions answered by the hospital doctors is shown in Figure 2. According to the two aspects of research question (ii), the subject areas of questionnaire II were divided into the doctors' estimation of patients' demands and their willingness to participate in a web 2.0 portal.

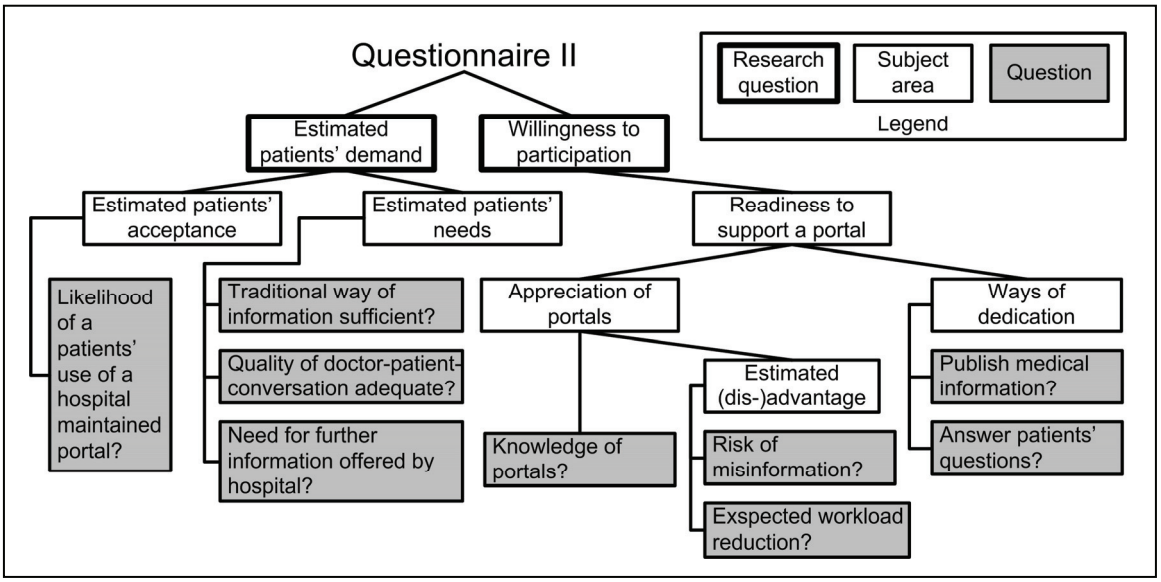

Figure 2. Relationship between research question ii and questionnaire II

The participants of questionnaire II show the following demographic characteristics. 26 percent of the polled medical doctors are female, there are no dominating units they are associated to and all have access to the internet within their working environments. See Figure 4 for the doctors' age distribution.

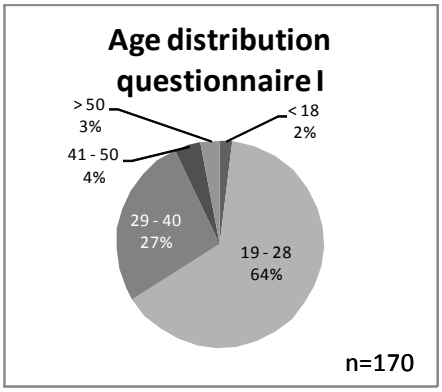

Figure 3. Age distribution questionnaire I

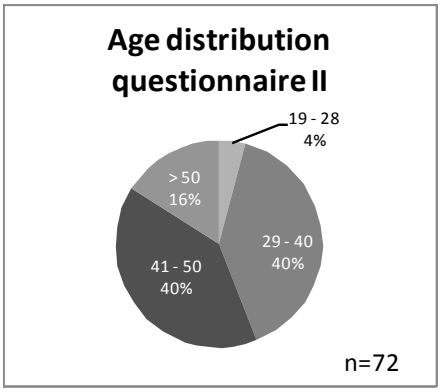

Figure 4. Age distribution questionnaire II

RESULTS

Appreciation of a web 2.0 knowledge transfer portal by potential patients

First the potential patients were asked whether they feel adequately informed about medical issues during their hospital stays. Only one fourth states to feel fully informed by the doctors. 35 percent of the patients quote to feel fully informed only after posing concrete questions. 13 percent are not satisfied with the information offered during a hospital stay. When the patients were asked whether they have ever been under a medical treatment without understanding its purpose, 35 percent claimed that they have been under a treatment that seemed at least questionably. This is interesting when compared to the fact that only 13 percent state to be unsatisfied with the medical explanations of attending doctors in hospitals. Besides, only 36 percent of the patients think that all of their questions to doctors have always been answered adequately compared to 18 percent who claim that sometimes the answers were incomprehensible and 46 percent who have not been satisfied with patient-doctors-conversations. See Figure 5, Figure 6 and Figure 7 for a visual presentation of these results.

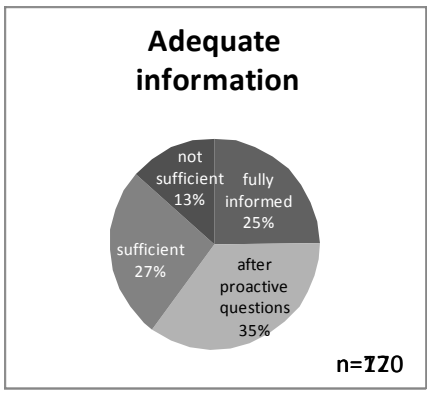

Figure 5. Adequate information

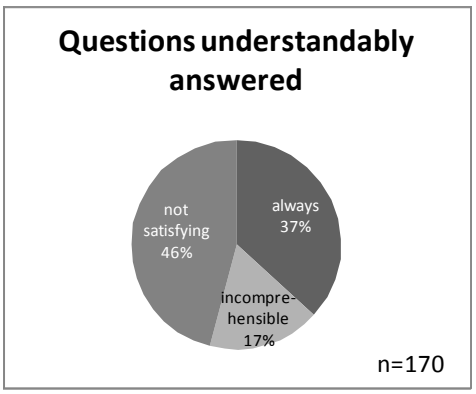

Figure 6. Questions understandably answered

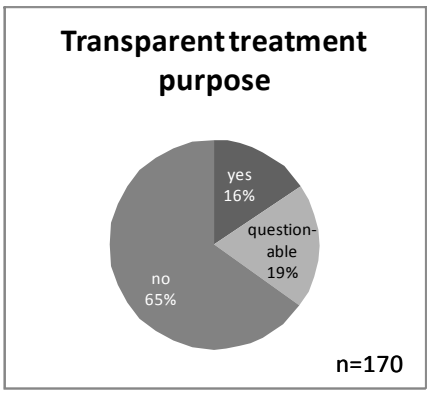

Figure 7. Transparent purpose

When the patients were asked about their preferred resource for further information after the diagnosis of a disease (multiple responses possible) the answers "attending doctor" and "internet" were checked by 83 percent of the participants. 32 percent state to search for information in books or health journals, 6 percent consult a GP and 1 percent has not searched for further information yet (see Figure 8).

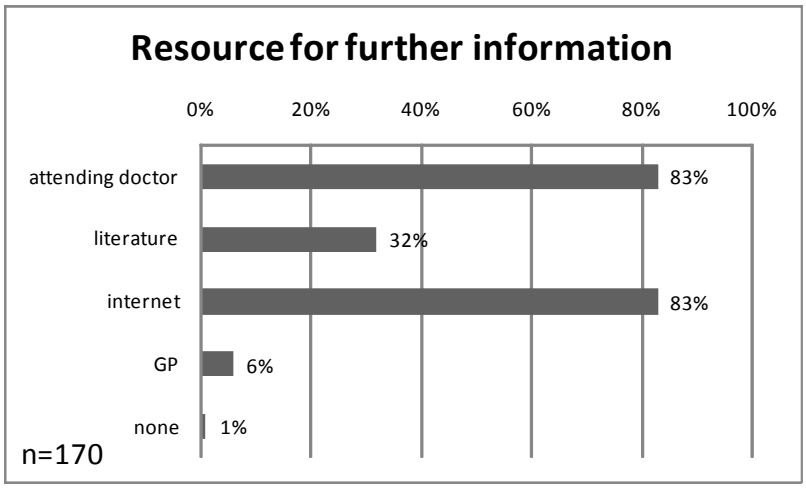

Figure 8. Resource for further information

74 percent of the potential patients say that they would "definitely", 24 percent "probably" take advantage of a web 2.0 portal that provides medical information. According to the amount and quality of existing online health portals 71 percent of the patients think that the situation is not satisfying and noticeable improvements have to be done. Only one percent claims the current situation as "excellent", 28 percent call it "sufficient" (see Figure 9 and Figure 10).

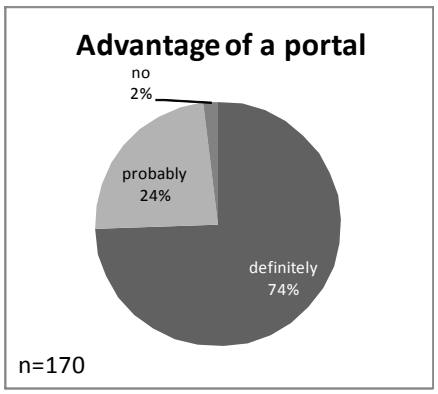

Figure 9. Advantage of a portal

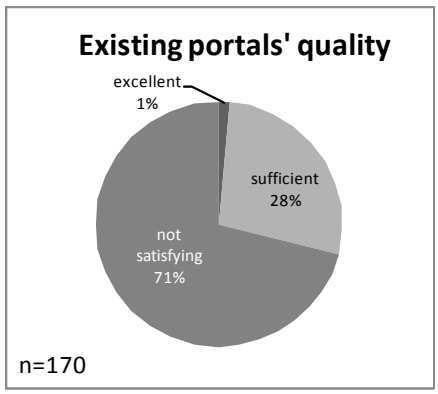

Figure 10. Existing portals' quality

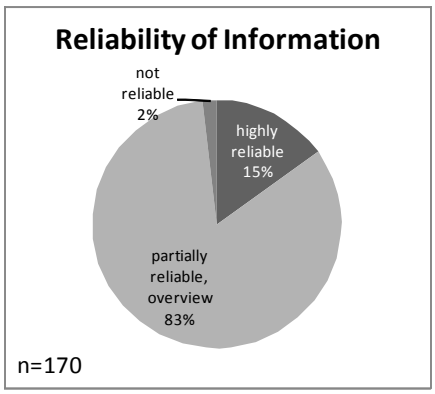

Figure 11. Reliability of online information

Since web 2.0 functions are dependent on extensive user participation we wanted to find out whether patients were willing to share experiences with diseases or treatments online. 76 percent would publish personal information about their medical history on the internet, 63 percent of these only anonymously. 81 percent would answer questions of patients with similar diseases, 50 percent of them only anonymously. 81 percent would probably agree to the publication of anonymous data related to their treatment (e.g. duration, side effects, and adverse events) by the hospital (see Figure 12, Figure 13, Figure 14).

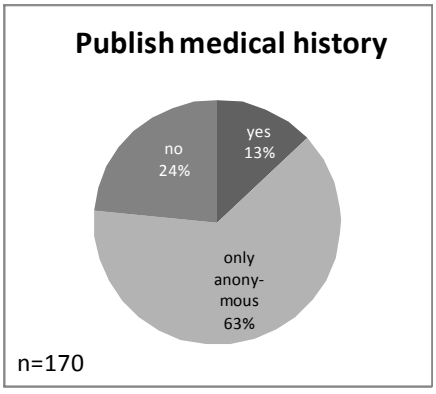

Figure 12. Publish medical history

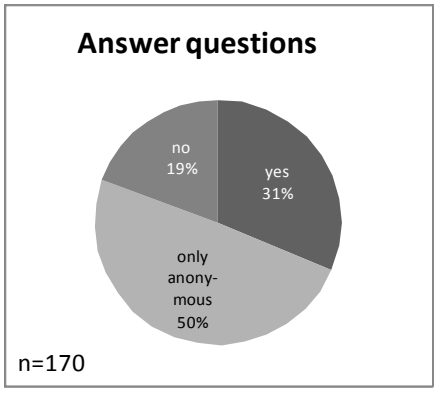

Figure 13. Answer questions

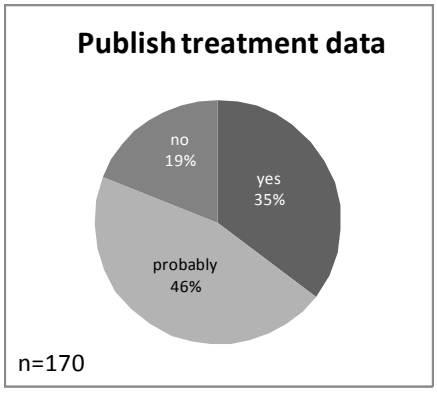

Figure 14. Publish treatment data

Finally we asked the potential patients whether they appraise health information on the internet to be credible and reliable. 15 percent believe that information offered in health portals is highly reliable. 83 percent quote that they think health information on the internet is partially reliable but useful to get an overview. Only 2 percent do not trust health information in online portals. Asked for the credibility of information when the author is explicitly stated 61 percent of the patients quote to trust the information compared to 39 percent who claim that the announcement of the author is not the only criterion for reliability (see Figure 11).

Willingness of doctors to participate in a web 2.0 knowledge transfer portal

Half of the polled doctors (51 percent) believe that patients are not sufficiently informed or know only some basic facts after a conversation with the responsible doctor in a hospital. Only 14 percent think that all relevant medical issues are explained within a patient-doctor-conversation. More definite are the results on the question whether doctors think that there should be more information material for patients offered by the hospital. For the majority (92 percent) the offer of more information material for patients is necessary, at least containing the most important facts on diseases and treatments. So in general,

doctors seem to recognize the patients' level of medical knowledge should be higher and the traditional knowledge transfer is not extensive enough to meet the current demands (Figure 15).

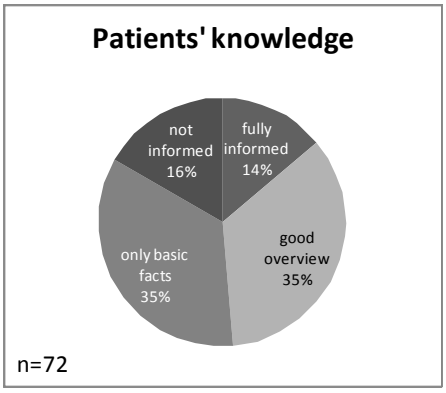

Figure 15. Patients' knowledge

42 percent of the polled doctors are sure that offering certain information to patients would reduce their workload because then there is no need to explain all details to each person individually. 25 percent do not believe in a workload reduction because of the efforts required to maintain the portal's content. One third even believes that such a portal could lead to more explanation work because of misinformation on the web or misinterpretation by the patients. In general doctors estimate that the risk of misinformation on web 2.0 portals is quite high (63 percent), especially when it is not offered and moderated by medical experts.

Interestingly only 36 percent of the doctors state that they know at least one health web 2.0 portal, the majority of 64 percent has never seen such a portal before. Nevertheless, the majority agrees with the idea of establishing a web 2.0 knowledge transfer portal offered and maintained by the hospital to support patients' information seeking (90 percent) and 79 percent believe that patients would definitely use such a portal to inform on medical issues.

Concerning the willingness to participate in the establishment and maintenance of such a portal the doctors were asked whether they would offer information material, answer patient questions or comment the patients' postings. 18 percent would definitely not publish medical information on certain treatments or surgeries and 17 percent would not answer questions in an online forum. In fact, the majority is willing to participate in such a portal. As Figure 16 and Figure 17 show, 25 percent respectively 14 percent of the doctors would offer medical information and answer questions of patients without any conditions. 28 percent would publish articles only during their working time compared to 48 percent who would react to questions and comments of patients only during working time.

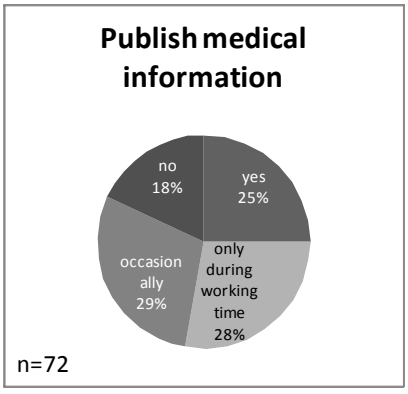

Figure 16. Publish medical information

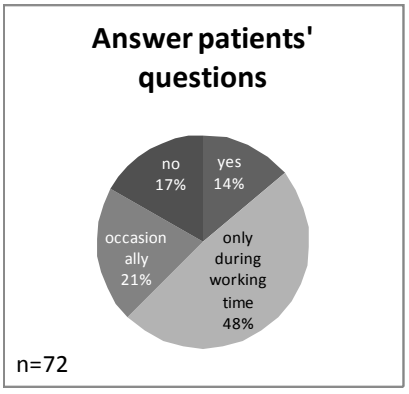

Figure 17. Answer patients' questions

Finally, also the doctors were asked about their estimation of credibility and reliability of medical information in online portals. 16 percent state that the information offered in health portals and forums is highly reliable, 83 percent believe that the

information is only partially reliable but in general useful to get an overview of a medical issue. Only one doctor stated the information to be completely unreliable.

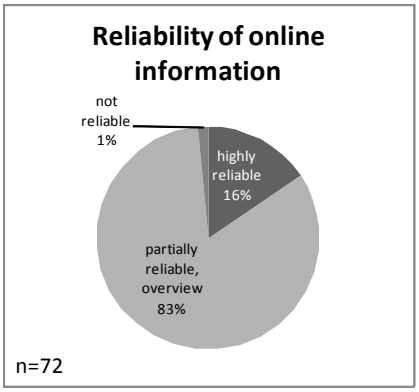

Figure 18. Reliability of online information

A correlation analysis using Kendall's tau rank correlation coefficient was conducted to measure whether the doctors' demographic characteristics influence the approval of web 2.0 health portals in general and whether this approval influences the willingness to participate in certain ways. We only present results with significance $Z > 0.95$.

Doctors' approval of web 2.0 health portals	Correlation (τ)	Significance (Z)
age group between 29 and 40 years	0.223	0.95
gender: male	0.225	0.95
enjoyment of computer work	0.424	0.99

Table 2. Doctors' general approval of web 2.0 portals

According to the correlation analysis the typical hospital doctor who approves a web 2.0 knowledge transfer portal to provide information to patients is rather young, male and likes to work with the computer (see Table 2).

Doctors who approve web 2.0 are willing to	Correlation (τ)	Significance (Z)
publish medical information	0.236	0.95
answer patients' questions	0.249	0.95
publish their authorship of information /answers	0.262	0.95
spend up to 3 hours a week	0.324	0.99

Table 3. Doctors' willingness to participate in the web 2.0 portals

Doctors who generally like the idea of sharing knowledge with patients through online health portals and web 2.0 functions would more likely publish medical information and participate in forums by answering patients' questions. Furthermore they would not only participate anonymously but publish their authorship to raise credibility of the information. Last we found out that they would spend quite a lot of time (up to three hours a week) to maintain the content of such a portal (see Table 3).

DISCUSSION

The results definitely show that there is great potential for a hospital to establish a web 2.0 knowledge portal to offer medical information that is appreciated by patients, since the current quality of existing online health portals is not sufficient to meet the demands of at least one third of the polled patients. Furthermore, even half of the polled hospital doctors believe the knowledge transferred from an attending doctor to a patient not to be satisfactory. To gather further knowledge after a diagnosis patients use the internet as a source of information as often as they consult their attending doctor.

Today, patients do not only want to gather further information but also learn from other's experiences after a serious diagnosis. Ryan found out that according to hybrid virtual communities of multiple sclerosis patients the majority of the knowledge exchanged were not "health-related". (Ryan, 2007) That is why especially in the field of healthcare the demands for online websites changed from pure information portals to interaction services. (Daum and Krcmar, 2002) Web 2.0

functions are well suited instruments to transfer health knowledge in addition to the presentation of medical information through traditional means, like explanation of diseases and treatments with written text, pictures, videos and navigation via links. (Schweizer, Leihmeister and Krcmar, 2006) In our case, knowledge can be transferred from doctors to patients, family members or other interested parties but also among patients who have made relevant experiences and want to share their knowledge with others.

Interestingly the findings show that the appraisal of credibility and reliability concerning internet information of both questioned groups are very alike. In both groups, 83 percent state that they do partially trust the information published on the web and find it quite reliable to get an overview of an area. The percentage rate of the patients (15 percent) as well as the doctors' percentage rate (16 percent) unconditionally trusting health information on the internet seems quite high. Therefore it is important to establish reliable health online portals offered by health institutions or hospitals to guarantee high-quality knowledge and reduce the risk of misinformation. Besides, the survey showed that patients rather trust information when its author is explicitly stated.

For that reason the main success factor of a health web 2.0 knowledge transfer portal is the participation of doctors who share their expert knowledge, react on the patients' questions and supervise the contents according to its correctness. Furthermore, it is important that doctors are willing to publish the authorship to increase credibility.

The major advantage for the hospital when offering a healthcare portal including web 2.0 functions is, that the statements given by the patients can be monitored and specialists can react on incorrect information to avoid negative emotions that perhaps lead to risky patient decisions. Furthermore, the hospital in general and its doctors in particular can easily react on special but so far unknown demands e.g. to the need for more detailed information, discontent with the treatment during a hospital stay or discontent with the attending doctor. In fact, the hospital can even comment on negative ratings by explaining the situation from its point of view.

For the health community in general and patients in particular the major advantages of a hospital managed web 2.0 portal are the offer of a new kind of resource of information concerning diseases, surgeries, medication and other treatments, the guarantee to get these information directly from medical specialists as well as other patients concerned, and the possibility to share own experiences with others in order to get medical or emotional feedback. Furthermore the opportunity is given both to patients and medical doctors to form up peers and establish new social networks focused on particular medical areas.

OUTLOOK

The results of the study are limited to the presented case according to potential patients' and doctors' opinions but they can serve as a basis for further empirical research to develop the conceptual design of a health web 2.0 portal meeting the demands of patients. Success factors for such an application can be derived from these insights. When planning such a portal the following factors have to be obtained at least:

- High-quality information provided by medical experts;
- Extensive information from several medical disciplines offered within one hospital;
- Transparency of authorship to increase reliability;
- Opportunity to ask a doctor and receive high-quality answers via online forums;
- Possibility to contact a doctor in private when the questions shall not be published;
- Opportunity for patients to share knowledge;
- User generated content reviewed by medical experts;
- Opportunity to discuss personal health experiences;
- Support of the development of virtual communities to unite patients suffering from similar diseases;
- Rating of hospitals / doctors / treatments.

The success factors can have diverse impacts to patients' interests. Therefore, in a follow-up study these factors could be evaluated by a broad sample of patients to verify the importance of each single criterion and find out which factors are more important than others. The study could be conducted using a questionnaire to let the patients rate the success factors within an ordinal five-point-scale from "Totally relevant" = 1 to "Not relevant at all" = 5. These results should be regarded when the health 2.0 portal is designed and implemented.

REFERENCES

1. Alkhateeb, F. M., Clauson, K. A., Khanfar, N. M. and Latif, D. A. (2008) Legal and regulatory risk associated with web 2.0 adoption by pharmaceutical companies, Journal of Medical Marketing, 8, 4, 311-318.
2. Benlian, A. and Hess, T. (2008) Supporting global software development with Web 2.0 technologies – Insights from an empirical study, Proceedings of the 14th Americas Conference on Information Systems (AMCIS 2008), Toronto, Canada, Paper 294, 1-9.
3. Bortz, J. and Doering, N. (2006) Forschungsmethoden und Evaluation: für Human- und Sozialwissenschaftler, Springer, Berlin.
4. Dannecker, A. and Lechner, U. (2007) Knowledge Creation in Virtual Communities of Patients: The Role of Quality Assurance, Proceedings of the 13th Americas Conference on Information Systems (AMCIS 2007), Keystone, USA, Paper 139, 1-10.
5. Daum, M. and Krcmar, H. (2002) Webbasierte Informations- und Interaktionsangebote für Krebspatienten – Ein Überblick. Working Paper No. 111. Universität Hohenheim, Lehrstuhl für Wirtschaftsinformatik.
6. Ganesh, J. and Padmanabhuni, S, (2007) Web 2.0: Conceptual Framework and Research Directions, Proceedings of the 13th Americas Conference on Information Systems (AMCIS 2007), Keystone, USA, Paper 332, 1-9.
7. Giustini, D. (2006) How Web 2.0 is changing medicine, British Medical Journal, 333, 1283-1284.
8. Ghosh, B. and Scott, J. (2008) Knowledge Management for Healthcare Organizations: Comparing Strategies with Technical Support, Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008), Hawaii, USA, 329.
9. Huang, C D. and Behara, R. (2007) Outcome-Driven Experiential Learning MIS Courses in Web 2.0 Environment, Proceedings of the 13th Americas Conference on Information Systems (AMCIS 2007), Keystone, USA, Paper 257, 1-7.
10. KHDBS (2009) Website of the Krankenhaus der Barmherzigen Schwestern Linz, available at http://www.bhs-linz.at/, accessed on 2nd February 2009.
11. Kotorov, R. and Hsu, E. (2001) A model for enterprise portal management, Journal of Knowledge Management, 5, 1, 86-93.
12. Lee, C. S., Goh, D. H. and Chua, A. Y. (2007) Evaluation of Hospital Portals Using Knowledge Management Mechanisms, Proceedings of 10th International Conference on Asian Digital Libraries (ICADL 2007), Hanoi, Vietnam, 15-23.
13. Leimeister, J. M., Daum, M. and Krcmar, H. (2002) Mobile Virtual Healthcare Communities: An Approach to Community Engineering for Cancer Patients, Proceedings of the 10th European Conference on Information Systems (ECIS 2002), Gdansk, Poland, 1626-1637.
14. Lin, C., Tan, B. and Chang, S. (2008) An exploratory model of knowledge flow barriers within healthcare organizations, Information & Management, 45, 5, 331-339.
15. Mack, R., Ravin, Y. and Byrd, R. J. (2001) Knowledge Portals and the emerging digital knowledge workplace, IBM Systems Journal, 40, 4, 925-955.
16. Nonaka, I. (1990) Redundant, Overlapping Organization: A Japanese approach to managing the innovation process, California Management Review, 32, 3, 27-38.
17. O'Reilly, T. (2005) What Is Web 2.0? available at http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html, accessed on 3rd February 2009.
18. OEBIG (2009) Website OEBIG Spitalskompass, available at http://www.spitalskompass.at/, accessed on 3rd February 2009.
19. Perry, I. (2006) Can Information Systems bring wisdom? Dealing with the primacy of knowledge in an in-patient mental health setting, Proceedings of the 12th Americas Conference on Information Systems (AMCIS 2006), Acapulco, Mexico, 2592-2598.

20. Pinsonneault, A. and Kraemer, K. L. (1993) Survey Research Methodology in Management Information Systems: An Assessment, Journal of Management Information Systems, 10, 2, 75-105.
21. Polanyi, M. (1958) Personal knowledge: Towards a post-critical philosophy. Routledge and Kegan Paul, London.
22. Probst, G., Raub, S. and Romhardt, K. (1999) Wissen managen: Wie Unternehmen ihre wertvollste Ressource optimal nutzen, Gabler, Wiesbaden.
23. Richards, D. (2009) A Social Software/Web 2.0 Approach to Collaborative Knowledge Engineering, Information Sciences, Accepted Manuscript.
24. Ridings, C. (2003) Patterns of Chatter: An Empirical Case Study of Participation in an Online Health Community, Proceedings of the 24th International Conference on Information Systems (ICIS 2003), Seattle, USA, 952-958.
25. Rosenberg, R. S. (2004) The Social Impact of Computers, Elsevier Academic Press, San Diego.
26. Ryan, S. D. (2007) Social Capital and Knowledge Exchange in Hybrid Virtual Communities for Patients with Multiple Sclerosis: Preliminary Results, Proceedings of the 13th Americas Conference on Information Systems (AMCIS 2007), Keystone, USA, Paper 191, 1-7.
27. Schweizer, K. J., Leimeister, J. M. and Krcmar, H. (2006) The role of virtual communities for the social network of cancer patients, Proceedings of the 12th Americas Conference on Information Systems (AMCIS 2006), Acapulco, Mexico, 4470-4479.
28. Smith, J. (2000) Health Management Information Systems. Open University Press, Buckingham.
29. Statistik Austria (2009) IKT-Einsatz in Haushalten – Einsatz von Information- und Kommunikationstechnologien in Haushalten 2008, available at http://www.statistik.at/web_de/, accessed on 24th January 2009.
30. Ullrich, C., Borau, K., Lou, H., Tan, X., Shen, L., Shen, R. (2008) Why Web 2.0 is good for learning and for research: principles and prototypes, Proceedings of the 17th international conference on World Wide Web (WWW '08), Beijing, China, 705-714.
31. Wigand, R., Benjamin, R. and Birkland, L. H. (2008) Web 2.0 and Beyond: Implications for Electronic Commerce, Proceedings of the 10th International Conference on Electronic Commerce (ICEC '08), Innsbruck, Austria. Paper 7, 1-5.
32. Wright, A., Bates, D. W., Middleton, B., Hongsermeier, T., Kashyap, V., Thomas, S. M. and Sittig, D. F. (2008) Creating and sharing clinical decision support content with Web 2.0: Issues and examples, Journal of Biomedical Informatics, Accepted Manuscript.
33. Yan, L., Yang, J. and Wang, W. (2008) Using Web 2.0 for Knowledge Management in Higher Education, Proceedings of the 2008 International Symposium on Knowledge Acquisition and Modeling (KAM '08), Wuhan, China, 419-423.