
Use of social media by healthcare professionals in Greece: an exploratory study

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Abstract: The continuously and rapidly changing landscape in the fields of communications, Internet and social media make it imperative for professionals to better understand the role of Information and Communication Technologies

and their impact on everyday activities. Several frameworks have been proposed in order to capture various dimensions of social media and measure their impact on people's social, professional and other activities. The effect of social media and Web 2.0 applications on the healthcare sector is also significant. This paper examines Greek healthcare professionals' attitudes towards internet, social media and mobile technologies, explores their familiarity with social networks and associates their answers with their professional profile. The results of this exploratory study are discussed within the context of the growing international relevant literature.

Keywords: healthcare professionals; social media; web 2.0; medical information; electronic healthcare.

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1 Introduction

Humans group together in order to interact, cooperate, exchange ideas and influence each other. According to Christakis and Fowler (2009), people groupings can be broken down into four different types: unconnected groups, bucket brigade, telephone tree and military squad model, moving from the less to the most tightly connected groupings. Consequently, in a very basic sense, a social network is an organised set of people consisting of two elements: human beings and the connections between them. According to Freeman (2004), a social network is formed by individuals (or organisations), connected with more or less specific types of interdependency: friendship, kinship, common interest, financial exchange, dislike, sexual relationships and relationships of beliefs, knowledge or prestige. Real, everyday social networks are organically characterised by the natural tendency of each person to seek out and make many or few friends, have large or small families and work privately or anonymously.

Social media refer to web-based and mobile technologies that support interactions within social networks and turn communication into an interactive dialogue. Kaplan and Haenlein (2010) define social media as a group of internet-based applications, built on the ideological and technological foundations of Web 2.0, allowing the creation and exchange of user-generated content (Terry, 2009). Social media offer ubiquitous access and alternative communication channels and techniques, thus substantially changing the way of communication between organisations, communities and individuals (Kietzmann et al., 2011).

Based on their aims, social media and the relevant social networks can be classified into six distinguished categories: collaborative media (e.g. Wikipedia), blogs and micro blogs (e.g. Twitter), content communities (e.g. YouTube), social networking media (e.g. Facebook), virtual game worlds (e.g. World of Warcraft) and virtual social worlds (e.g. Second Life) (Kaplan and Haenlein, 2010). Social media comprise of a wide range of services, including forums, blogs and micro blogs, wikis, podcasts, photos, videos, item rating and bookmarking. Many of these services can be integrated via social network aggregation platforms (Kovic et al., 2008).

Social media have been widely spread during the last few years. Internet users, worldwide, spent, more time on social media sites than on email (on average, 4.6 vs. 4.4 hours per week), indicating that social media have overcome email as the main reason to be online (eMarketer, 2010). Similarly, Henrikson (2011) clearly depicts the potential of global social media, in terms of users, content and opportunities.

Recent advances on internet technologies, particularly the participative internet (e.g. Web 2.0), did transform patterns of – amongst others – health-related communication, by creating new information highways for instant communication and online feedback between healthcare professionals and patients (Eysenbach, 2008; Smith and Smith, 2011). However, health-related Web 2.0 concepts (e.g. Health 2.0 and Medicine 2.0) are still considered evolving (Van De Belt et al., 2010). Thus, social media, a great information equaliser, is radically transforming the way people within the healthcare sector, around the world, communicate and facilitate accurate health information to reach many people, more than any other technology or process in the past. For example, it is confirmed that one emergency message about an epidemic outbreak can be spread through Twitter faster than any influenza virus (McNab, 2009). Additionally, text and structural data mining techniques in social media have proven to act as disease surveillance tools (Corley et al., 2010).

Social networks on healthcare era create considerable potential value for the relevant organisations, as they can be used to immediately reach and interact with stakeholders, aggregate relevant information from many sources in a short time and leverage collaboration (Keckley and Hoffman, 2010; DeVries, 2012). On that perspective, many healthcare organisations are now starting to create important social media facilities to promote clinical success, disseminate best practices, interact with, and keep patients informed about their disease, and create patients' and healthcare professionals' online communities (Giustini, 2006; Keckley and Hoffman, 2010). The importance of social media in healthcare professionals' daily practice is also noted by professional medical societies which release explicit guides for their members (AAOS, 2012). As such, social media is revolutionising healthcare, providing limitless access to real-time resources for information.

Taking one step forward, social media in healthcare has introduced the term *Social Health*. Gwee (2011) describes the 6 Ps' of social health which reflect the major role of social media in health:

- 1 *Personalisation*: Healthcare and medicine are becoming more personalised, both in terms of access and treatment (e.g. molecular diagnostics and biomarkers).
- 2 *Participatory*: the era of internet has introduced the terms of online patient communities and ePatients (e.g. the 'e-Patient Dave' website, a leader in this field). Trend is towards introducing Participatory Medicine, where networked patients shift from being mere passengers to responsible drivers of their health (Iloudi, et al., 2010), while healthcare providers encourage and value them as full partners.
- 3 *Preventative*: Preventative Medicine represents the need to not just cure, but to encourage behaviour change leading to a healthier lifestyle, which in turn could prevent an illness (health promotion) (WHO, 2009).
- 4 *Peer-to-Peer/Patients*: Patients are at the heart of everything that Social Health stands for. Patients are now helping themselves and seeking other 'patients like me'. Social media has really changed the paradigm of how patients and health personnel seek health information.

- 5 *Portability*: It firstly refers to data, in the sense of having access to someone's personal health data. Examples constitute the Blue Button Program for military beneficiaries and the EU project epSOS, where patients will shortly be able to have access and retrieve their own Patient Summaries generated by and kept in EU countries different from their home country, automatically translated into patients' country language. Both programmes are made possible by using structured clinical documents under the Health Level Seven (HL7) International CDA standard. Secondly, portability is thought in the physical sense – how the mobile platform is reshaping healthcare access, in a very personal way.
- 6 *Passion*: Usually, it is about some personal experience and/or major health incident that have fuelled the passions of individuals and groups to do what they do.

Public health programmes have demonstrated considerable success in adapting social media as a communication mechanism for health promotion efforts, such as dietary interventions and smoking cessation, using the web for global access instantly (Vance et al., 2009).

Nevertheless, indirect and sometimes unintended negative impacts of social media usage have also been identified, like the increase of potentially erroneous or non-credible health information, due to the participatory nature of social media, which creates open forums for information exchange (Kortum et al., 2008). Additionally, a growing body of recent research (Greysen et al., 2010; Mansfield et al., 2011; Snyder, 2011; Quist, 2011) raise professional and ethical considerations to the use of social media within medical profession, especially if no rules, boundaries and regulations are established. For example, many physicians may find the application of medical professional principles to an online environment very challenging; or they may not consider the potential negative impact of the online content on their patients, the public and the entire profession itself. Furthermore, inappropriate use of social media may harm patients' and professionals' sensitive data, question the trust between them and challenge the boundaries between public and private. Research on the challenges of Web 2.0 within healthcare system in Catalonia (Lupianez-Villanueva et al., 2009) has shown that whereas the main characteristic of the Web 2.0 is the opportunity for social interaction, the healthcare system, at large, is characterised by: a lack of interactive communication technologies available on the internet; a lack of professional production of healthcare information on the internet; and a lack of interaction between these professionals and patients on the internet. Nevertheless, internet and social media have changed patient – physician relationship. This is a fact and the paradigm shift cannot be ignored (Biermann et al., 2006; Sechrest, 2010).

Social media and Web 2.0 applications can also have a great impact in both patients' and health personnel's continuous education and professional development (Boulos et al., 2006). More recent research showed that this is a reality, but not without restrictions. Ward et al. (2008) realised that as far as UK is concerned, although the use of e-learning within the health domain has been developed significantly in recent years, there is not a significant demand for Web 2.0 technologies. Usher (2011) made an extensive research on social media in Australia and concluded that healthcare professionals preferred the online delivery of educational courses. Relevant efforts have been assessed by Viitanen et al. (2011) and Martikainen et al. (2012) concerning health Information Technologies and the medical profession in Finland, where respective questionnaires were proposed and processed.

Empirical research concerning attitudes, intention and actual use of social media among healthcare professionals seems to be niche and innovative. Nordqvist et al. (2009) explored paediatric practitioners' attitudes towards the introduction of a Web portal for providing young type 1 diabetes patients with interactive pedagogic devices, social networking tools and locally produced self-care and treatment information. Researchers identified positive attitudes towards portal introduction to clinical practice and satisfaction with the way portal turned out. Nevertheless, they found that while some professionals expected email communication with patients and online patient information to save time during routine care, others emphasised the importance of maintaining face-to-face communication. Finally, online peer-to-peer communication was considered as a valuable function, but most clinicians did not expect the portal to be used extensively for social networking amongst their patients.

A survey on the identification of the socio-demographic and health-related factors associated with adult social media users in the USA (Chou et al., 2009) found that 69% of individuals reported Internet access in 2007. Among internet users, 5% had participated in an online support group, 7% reported blogging, and 23% used a social networking site. Multivariate analysis found that younger age was the only significant predictor of blogging and social networking site participation. Additionally, a significant linear relationship was observed, with younger categories reporting more frequent use. Younger age, poorer subjective health, and a personal cancer experience predicted support group participation. In general, this study realised that social media were penetrating the US population independently of education, race/ethnicity, or healthcare access.

A more recent review on social media use in the US healthcare sector (Keckley and Hoffman, 2010) indicated that 60% of surveyed physicians and 65% of surveyed nurses were interested in using social networks for professional purposes, while approximately 1 out of every 6 physicians was member of at least one online physicians' network (e.g. Sermo). Additionally, it was shown that social media offered information for patients' health and wellness maintenance (e.g. WEGO portal and WebMD dictionary); disease management (e.g. 'PatientsLikeMe' portal and 'Inspire' patient community); clinical trial recruitment; personal health record management and treatment selection (Sarasohn-Kahn, 2008).

In an older study on knowledge and utilisation pattern of information technology among healthcare professionals and medical students in a university teaching hospital in Nigeria (Bello, 2004), it was found that a small percentage of the participants (26%) possessed a computer and an even smaller percentage (18.9%) had been registered as computer-savvy (e.g. good knowledge of computers). On the other hand, the percentage of participants demonstrating positive attitude and good utilisation habits was significantly higher (39.9%). Differences among groups of participants were also recorded, with doctors being more knowledgeable on computers and showing better utilisation habits and attitudes, compared with medical students and health records officers.

Jones et al. (2011) studied the use of metrics in discussion forums on self-harm and their contribution in forum management. They realised that metrics could be useful for the forum managers, functioning as an additional way for discussion forums comparisons; additionally, metrics could allow better moderation and support of forums, as well as more effective use of the collected data, by identifying participative stances of individuals.

In a Greek survey on acceptance and use of Health 2.0 initiatives among nursing undergraduate students (Gallos et al., 2010) the importance of perceived usefulness in relation to attitude towards use and behavioural intention was highlighted. Further observations were related with the insignificant effect of the intention to use Health 2.0 initiatives in relation to the actual use of such sites. Results also revealed a gap between participants' perceptions and beliefs, related with certain areas of Health 2.0 initiatives and their technology adoption.

A newer trend on this type of research is the application of specific theories (i.e. the Theory of Planned Behaviour) to investigate healthcare professionals' intentions to use Web 2.0 applications (Archambault et al., 2010).

All the above indicate that the healthcare domain is evolving along many trajectories with the help of social media. Stakeholders seem to embrace social media in order to improve the quality of care to which patients have access. Perhaps, most importantly, there is a shift from questioning the efficacy of social media in healthcare to experimenting with how it can be used more effectively and how healthcare is changing (Lewis, 2011).

As far as Greece concerns, to the best of our knowledge, only Gallos et al.'s (2010) survey taps Health 2.0 use among nursing students, but not the quantity and quality of social media use amongst healthcare professionals. Thus, the present exploratory survey tries to fill this gap by focusing on the level of knowledge and use of internet and social media technologies and the acceptance and trust of social media for social, professional and general activities. It was anticipated that data collection could model the profiles of healthcare professionals, get useful insights on their motivations on using social media and discover future trends concerning the fusion of social media and medical information.

2 Methodology

2.1 The questionnaire

In order to collect data, a detailed questionnaire was designed through Google Spreadsheets and made available to participating healthcare professionals both online and on paper. The questionnaire consisted of 41 questions of different types (e.g. 'yes/no', multiple answers, evaluation questions, using '1 to 5' and '1 to 10' level scales and free text), divided into three sections. The first section included demographic questions and recorded participants' general information. The second section recorded participants' actual behaviour, (e.g. use of information technologies). The third section recorded participants' familiarity with social media applications, the level of usage, the way that social media were employed within the health sector (e.g. personal, professional use), as well as the degree of acceptance of social media in a professional level.

Face validity may motivate a research subject to participate in a specific test, as it shows to participants the relevance of the test parts with its goal. Face validity is very important in cases of attitude measurement scales. In these cases, there may be a great difference between what the scale seems to be measuring (face validity) and what it really measures (Carmines and Zeller, 1979; Koulakoglou, 1998; Burns, 2000; Apostolakis and Stamouli, 2006).

In the current study, the first author (IA), having a more than 15 years of expertise in the field, checked the face validity. In one round, he distributed a first version of the questionnaire to 10 individuals of the study population, representing about 5% of the final sample. Based on their replies, improvements were made to (a) the expression/formulation of several questions, (b) the order of questions in particular section of the questionnaire and (c) the scale of measurement of some questions.

The reliability of the questionnaire was satisfactory (Cronbach's $\alpha = .738$).

2.2 *The participants*

In an effort to receive valid feedback from key users in the Greek healthcare sector, we invited professionals who work in the whole spectrum of the Greek health sector to participate in the study. The participants belonged to specific target groups, like clinical doctors, nurses, administrative personnel, technicians and information technology professionals, covering the totality of healthcare practitioners in Greece. Our sample comprised students and alumni of the National School of Public Health (NSPH), located in Athens, doctors' associations in Greece, members of Athens Medical Society (established in 1835, covering at least 30,000 medical practitioners) and ICT related staff in Greek public healthcare institutions.

The sample was weighted to include proportional population percentages of healthcare professionals regarding their area of expertise. The relative proportions of health professionals in Greece derived from elements of the Hellenic Statistical Authority.

2.3 *Procedure*

The majority of the survey participants were NSPH graduates, employed to the public sector at the period of the study. A letter, stating the purpose of the study and meant usefulness was sent by email to all members of the NSPH database of graduates, whose email had been recorded in the database. Emails were disseminated for a period of 3 months (March–May 2011). Participants received a hyperlink to a Google Spreadsheets page containing the questionnaire, as well as written instructions on how to fill it. Special emphasis was given to the protection of participants' anonymity. Finally, participants were provided with the option to be informed about the results of the survey by providing a valid email address in a relevant field, within the questionnaire.

The questionnaire was additionally distributed to a few participants during the 37th National Medical Conference, held in Athens, from 17 to 21 of May 2011.

Statistical processing and data analysis was conducted with the use of SPSS statistics 17, following the codification of the questions with conceptual consistency (Apostolakis et al., 2003; Apostolakis and Stamouli, 2007; Apostolakis et al., 2009). The statistical techniques included using χ^2 independence test, descriptive measures/indexes and various charts, as illustrated in the following section. The same data was also processed with Weka data mining suite and several data mining techniques in order to discover hidden knowledge of potential interest. The results presented in this study comprise a grouping of the participants into previously unknown clusters and an analysis of the characteristics of each group.

3 Results

3.1 Participants' profile

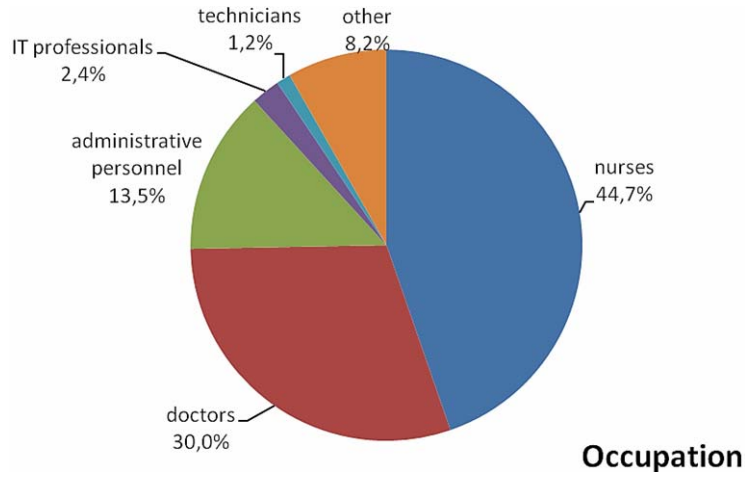
Sample consisted of 170 professionals. Their basic demographic characteristics are presented in Table 1 and in Figure 1.

Table 1 Demographics of participants

	<i>N</i>	(%)
<i>Gender</i>		
Male	78	46.3
Female	90	53.7
<i>Age</i>		
< 25	3	2.0
25–44	123	73.5
45–65	40	23.6
> 65	2	0.9
<i>Income (yearly) (€)</i>		
< 15,000	17	10.0
15,000–30,000	84	50.2
30,001–50,000	50	29.7
> 50,000	17	10.1
<i>Years of professional experience</i>		
< 3	10	5.8
3–10	50	30.1
11–20	58	34.6
> 20	49	29.5
<i>Workplace organisation</i>		
General hospital/Health centre	81	51.8
University hospital	16	9.9
Social care unit	4	2.5
Ministry of Health	7	4.4
Organisation supervised by the Ministry	20	12.6
Other	29	18.8

As can be seen, the majority of participants were women (53.7%), aged 24–44 years old (73.5%). Half (50.2%) had a yearly income up to 30,000 Euros. A third (30.1%) worked for up to 10 years, another third (34.6%), up to 20 years, and another third (29.5%) worked for more than 20 years. With regard to the place of employment, the majority (61.7%) was employed in hospitals and 38.3% in other health organisations (e.g. Ministry of Health, Regional Healthcare Authorities, etc.). A significant minority (44.7%) of those questioned, were nurses, while one third of them were doctors (Figure 1).

Figure 1 Sample distribution by occupation ($N = 170$) (see online version for colours)



3.2 Use and assessment of information and communication technologies

Data not appeared in Figures indicate that, the vast majority (83.4%) of people questioned were using computers both at home and the workplace. Almost all (99.1%) stated that they were using the Internet very often (92.6%), with access at home (94%), workplace (76%) and a mobile device (27%).

As seen in Figure 2, among participants, the level of using internet and Office applications was higher (e.g. 92% used email; 85% used Office applications; 91% used web browsing applications), compared to the level of using other health-related applications [e.g. 33% used Hospital Information Systems; 14% used other Information Systems, for example, Information system of sanitary region; only 5% used other applications (e.g. Clinical DSS)].

Figure 2 Use of applications and information systems (see online version for colours)

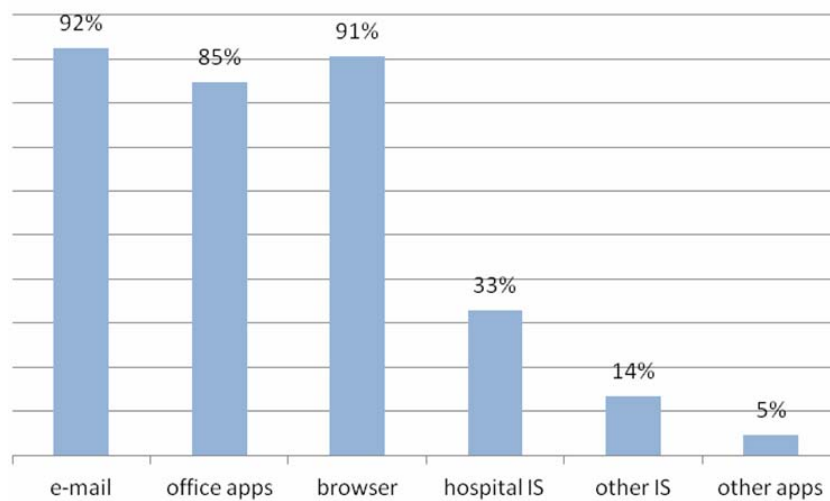
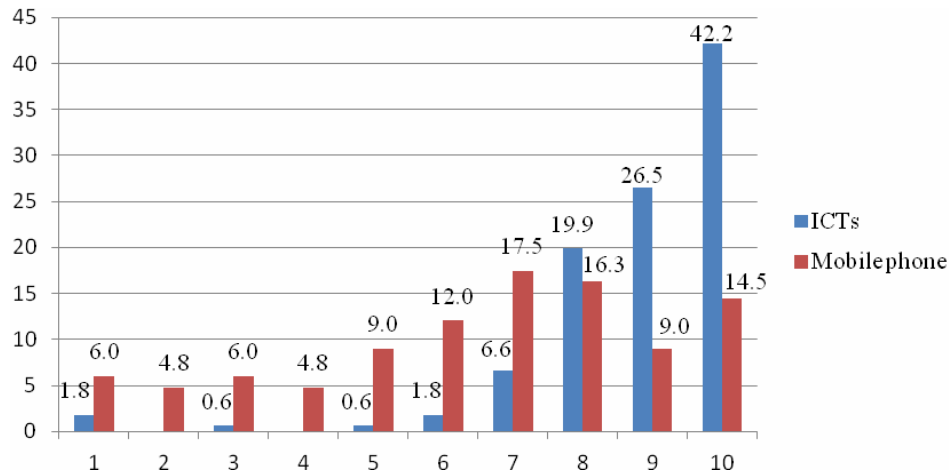


Figure 3 Usefulness of ICTs and mobile phones in work (see online version for colours)

Assessing participants' beliefs on whether ICTs facilitate their line of work (1 = 'ICTs facilitate very little' – 10 = 'ICTs absolutely facilitate') (Figure 3), 42.7% rated the usefulness of ICT with the higher value '10', while 26.5% rated it with '9'. On the other hand, compared to ICTs, when professionals rated facilitation provided by mobile phones, they were not so confident, although 69.3% rated it positively (scores \geq '6').

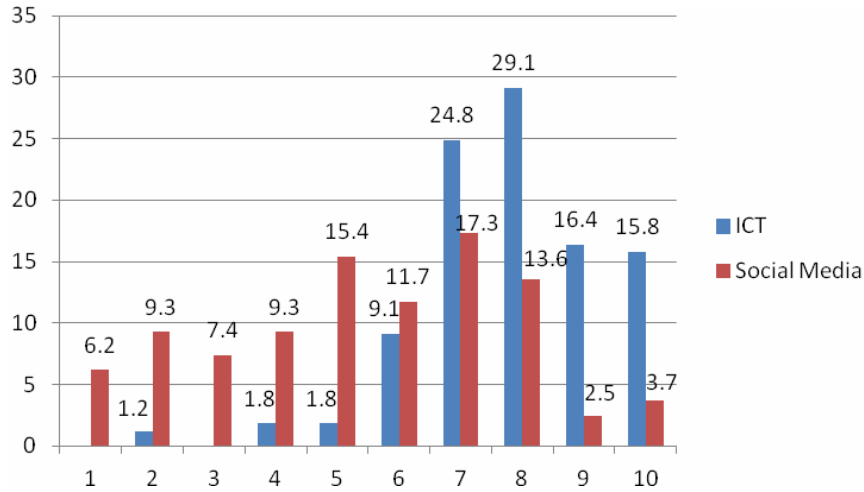
3.3 Use and assessment of social media and social networks

As far as participants' awareness of social media and social networking applications is concerned, only 13.2% declared ignorance. Social network applications users favoured podcasts and video sharing (98 participants), wikis (97 participants) and social networking (e.g. Facebook, LinkedIn) (88 participants). The least used applications (1 participant, each) were crowdsourcing (e.g. Innocentive, Topcoder), social media monitoring (e.g. BuzzMetric) and information aggregators (e.g. Netvibes, Twine).

When participants' perceived knowledge of social media and ICT was assessed in a ten-item scale (0 = 'Not at all' – 10 = 'Very well') (Figure 4), it was shown that in relation to social media, only 3.7% graded themselves with the highest grade, while almost half (46.5%) gave themselves a grade larger than '5'. As far as participants' ICT perceived knowledge, results showed that the majority (86.1%) thought themselves as highly knowledgeable (scores \geq '7'). Further analysis showed a statistically significant correlation between the level of familiarity with ICTs and participants' level of knowledge of social networks (Pearson's $r = 0.426$; $p = .000$).

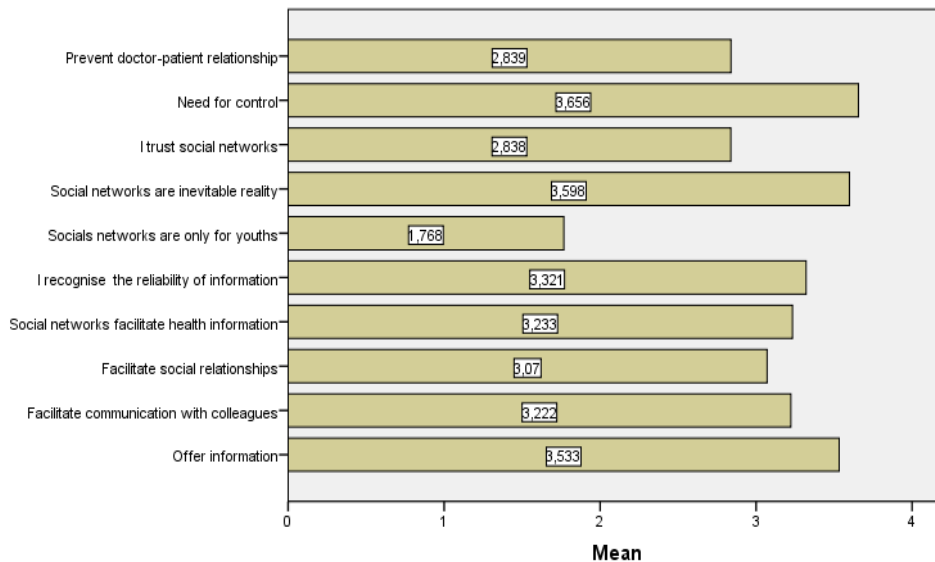
Participants were asked for the reasons of using social networks. The majority (71.7%) stated that they used them for personal purpose, half of them, for communicating with friends and relatives and 37.6% for communicating with colleagues. Social media use by the majority of healthcare professionals (53%) was mostly related to searching for medical information. Almost all (96%) trusted the eponymous piece of information and 57% trusted information from sources that had a security policy in place. Finally, only 3% never trusted the information from social networks.

Figure 4 Perceived knowledge of ICT and social media (see online version for colours)



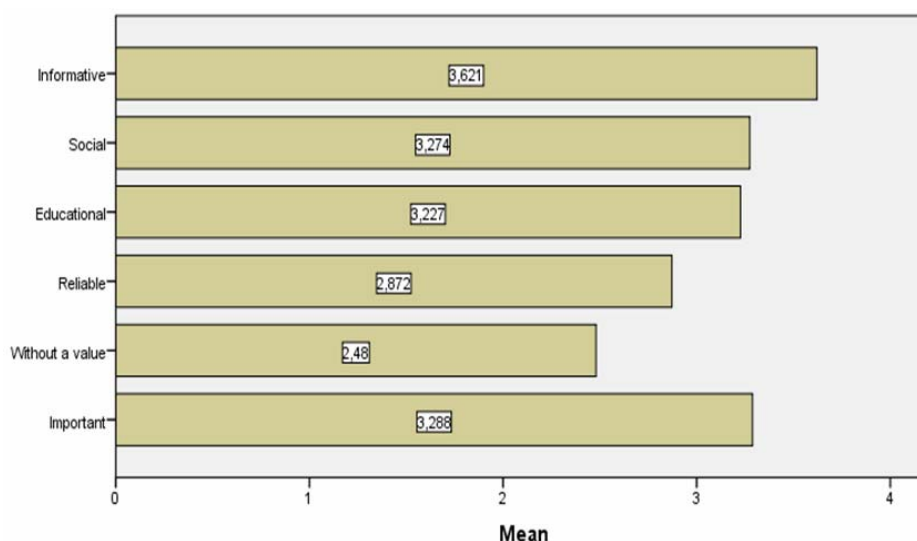
As seen in Figure 5, when participants were asked to rate the role of social networks in general (in a five-point Likert’s scale; higher scores represented stronger beliefs), they perceived social networks as an inevitable reality (mean = 3.598), but, at the same time, they were in favour of controlling them (mean = 3.656). Participants trusted social networks (mean = 2.838) and thought they improve their social lives (mean = 3.07). In a more specific issue, participants thought social networks hinder doctor-patient relationship (mean = 2.839).

Figure 5 The role of social networks in general (see online version for colours)



As can be seen in Figure 6, when participants evaluated the role of social networks in healthcare (in a five-point scale; higher scores represented stronger beliefs), they thought of them as of informative nature (mean = 3.621) and equally as of social and educational nature (mean = 3.274, mean = 3.227, respectively).

Figure 6 The role of social networks in healthcare (see online version for colours)



3.4 Determinants of social media and social networks use

The relationship between various determinants of ICT, social media and social networking applications use and healthcare professionals' profile was further explored.

3.4.1 Use of social media and profession

On Table 2, one can see that less of medical staff (doctors and nurses), compared with non-medical personnel used social networks for both personal (65.2% vs. 84.6%; $\chi^2 = 5.231$, $df = 1$, $p = 0.022$) and professional use (37.4% vs. 53.8%; $\chi^2 = 15.274$, $df = 1$, $p = .002$).

Table 2 Use of social networks and profession

	Profession		χ^2	P>
	Medical – Nursing	Non medical		
	N (%)	N (%)		
<i>Social networks (personal use)</i>				
Yes	75 (65.2)	33 (84.6)	5.231	.05
No	40 (34.8)	6 (15.4)		
<i>Social networks (professional use)</i>				
Yes	43 (37.4)	21 (53.8)	15.2	.05
No	72 (62.6)	18 (46.2)		

3.4.2 Mobile phone usefulness, knowledge of social media and profession

As far as the relation between participants' profession and their perceptions of mobile phone usefulness at work is concerned (Table 3), the chi-square test of independence was significant ($\chi^2 = 15.933$, $df = 6$, $p = .014$), suggesting that there is a relationship between whether or not a staff member is medical and the usefulness of mobile phones at work. 39.6% of medical staff thought that the use of mobile phones facilitates work 'quite enough', compared with 36.8% of non-medical staff who thought the same. Additionally, 36% of medical personnel considered mobile phones as facilitating work 'a lot', in comparison with the 34.2% of non-medical personnel who considered the same. Table 3 also shows that the chi-square test of independence between knowledge of social media and mobile phone usefulness at work was also significant ($\chi^2 = 10.675$, $df = 4$, $p = .030$). 35% of participants with low level of social media knowledge believed that the use of mobile phones facilitates work 'a little', 26.7%, 'enough' and 38.3% of them believed that the use of mobile phones facilitates work 'a lot'. On the other hand, 17.6% of participants with medium level of social media knowledge believed that the use of mobile phones makes work 'a little easier', 52.9% 'quite' easier and 29.4% of them thought that the use of mobile phones makes work 'much' easier.

Table 3 Mobile phone usefulness at work by profession and social media knowledge

	Mobile phone usefulness at work			χ^2	P>
	A little	Quite enough	A lot		
	N (%)	N (%)	N (%)		
<i>Profession</i>				15.9	.05
Medical – Nursing	27 (24.3)	44 (39.6)	40 (36.0)		
Non-medical	11 (28.9)	14 (36.8)	13 (34.2)		
<i>Knowledge of social media</i>				10.6	.05
Low	21 (35.0)	16 (26.7)	23 (38.3)		
Medium	12 (17.6)	36 (52.9)	20 (29.4)		
High	5 (20.8)	9 (37.5)	10 (41.7)		

3.4.3 Use of Hospital Information System and importance of social media at work

The chi-square test of independence between attitudes to social media use at work and use of HISs was significant ($\chi^2 = 14.973$, $df = 4$, $p = .005$), suggesting that participants' attitudes of social media importance at work were not related with Hospital Information Systems (HISs) use. Of those who considered use of social media at the work place as important ($N = 62$), 36 participants (58%) did not use HISs.

3.5 Mining questionnaire data for the hidden user profiles

We further analysed the participants' profile, by applying data mining techniques. We grouped participants into clusters based on their common characteristics and examined the differences between groups.

The typical steps of a data mining process were followed. Firstly, the dataset was cleaned from missing, error and outline values, which resulted to 166 instances, each containing 105 attributes. Consequently, data was fed to Weka, an open source data mining suite that offers various tools and algorithms for processing datasets. During the third step, an attribute selection process was performed, by manually filtering out redundant or highly related attributes based on the analysis performed in the previous step. This resulted to 90 attributes for the 166 instances. The filtered attributes mostly referred to the use of computer, mobile phone and internet access, which according to the collected answers was common for all participants in the survey. Additionally, all Likert-scale values were normalised to [0..1] range. Consequently, the *k*-means (Lloyd, 1982) clustering algorithm was applied, which divides the initial set of instances into discrete and coherent subsets using Euclidian Distance in the attributes' space.

The only input for *k*-means was the expected number of clusters, which was not known in advance. For this reason, different input values were applied and the number of clusters that gave us the best clustering scheme according to cluster compactness was selected. More specifically, the clustering scheme with the highest Dunn index score (Dunn, 1974) comprised three clusters, which in broad terms corresponded to: (a) young people with few years of professional experience but highly familiar with social networks and their applications (Group A), (b) seniors with an extended professional experience, but low familiarity with social media (Group C) and (c) people in the middle who use social media but are still cautious on their significance and trustfulness (Group B). Table 4 summarises the main features of each cluster. Numerical values close to 0 denote negative and values close to 1 positive attitude towards each feature, while other values correspond to the prevailing value for the feature in the corresponding cluster.

Table 4 Characteristics of the three clusters

	<i>Group A</i>	<i>Group B</i>	<i>Group C</i>
Size	76	48	42
Age	22–44	22–44	45–65
Income (in €)	15,000–30,000	15,000–30,000	30,001–50,000
Years in service	3–10	11–20	>20
Familiarity with ICT	0.783	0.711	0.664
Use Facebook	Y	N	N
Use Wikis	Y	Y	N
Familiarity with social networking applications	0.622	0.479	0.400
Social Networking for Personal Use	Y	Y	Y
Social Networking for Professional Use	Y	N	N
Social Networking for information	0.737	0.547	0.577
Social Networking for communication	0.638	0.490	0.470
Social Networking for socialisation	0.526	0.479	0.452
Social Networking for medical info	0.622	0.469	0.530
Trust social networks	0.536	0.375	0.417

Table 4 Characteristics of the three clusters (continued)

	<i>Group A</i>	<i>Group B</i>	<i>Group C</i>
Trust based on source	Y	N	N
Trust based on policy	Y	N	N
Social Media in personal life	0.665	0.506	0.541
Social Media in work	0.668	0.460	0.559
Social Media in health	0.656	0.496	0.599

From the data presented in Table 4, one can see that people in group A were familiar with social media and employed them both in their personal and professional environment (e.g. for contacting colleagues or promoting their work). They trusted information published in social networks only if the source was trustful and offered a security policy. This is in agreement with recent research findings (Grisot and Vassilakopoulou, 2011) that include the constitution of identity among the major challenges for building a successful communication platform for patients and healthcare professionals. What is important to notice here is that people in group C, although less familiar with social networks, tended to trust them more than people in group B. Finally, as far as the role of social media in participants' personal and professional life, as well as in health, in general is concerned, the questionnaire examined their educational, social and informative aspect. Once again, the senior people in cluster C were more positive on the importance of social media than younger people in cluster B, who declared more familiar with social networks but at the end have the most critical stance among all.

4 Discussion and conclusions

4.1 Implications

This online questionnaire-based survey explored the use of social media and social networks by healthcare professionals, for the first time in Greece. Social media use was additionally contrasted to the use of ICT in general and mobile phones in particular and their impact to participants' personal and professional life was examined. An in depth analysis of the results uncovered reasonable and less obvious relations between the participants' profession and attitudes and the use of social networks and HISs, between social media awareness and usefulness, or between familiarity, trust and perceived knowledge of social media. Finally, using data mining techniques, three main groups of professionals were detected: young professionals with high familiarity to ICT and social media; professionals with more years in service who declared familiar with ICT and used social media in their personal life, but were still sceptical against social networks and their usage for professional purposes; finally, professionals with many years in service, who, although declared less familiar with social networks and ICT, were readier to use them for professional purposes.

These findings are in line with those reported by researchers elsewhere in Europe (Lupianez-Villanueva et al., 2009; Nordqvist et al., 2009) and in the USA (Keckley and Hoffman, 2010). They show a double – contradictory scheme of attitude formation and use among healthcare professionals: On the one hand, staff feels familiar with ICT and social media applications, recognises their positive potentials, uses them, but leaves it out of the workplace. Given the fact that the majority of participants in this survey was

working at hospitals, one potential explanation for this would be that Greek hospitals – as work environment – lack an ‘ICT culture’. Indeed, Greek hospitals are currently within a transition phase, due to economic crisis and the demands for both expenditure and staff reduction. Although this situation seems to jeopardise any attempt for introduction of Web 2.0 applications within healthcare system, it creates great opportunities for policy makers to realise the advantages of introducing social media applications at workplace. This could be achieved through future detailed analysis of the initial results and/or further research – potentially theory based on the importance of social media in work, education and social life of healthcare professionals. Additionally, this analysis could lead to development of ISO standard indicators, which could be used to determine the usefulness of social media in healthcare work environments. Policy-makers can utilise these indicators to select medical environments, where the use of social media could prove itself an asset both for health workers as well as for patients. Pilot projects could be launched in these selected medical environments aiming at: (a) firstly making social media a part of everyday activity and (b) in the long run, striving, possibly through a Six-Sigma-like methodology, to reduce ‘defects’ in the organisational and operational level by means of using social media technologies.

The difference on social networks use at work between medical and non-medical staff – in favour of the non-medical personnel – could be explained on the basis of the nature of data exchanged. Medical staff may be reluctant to participate in medical or patient-related information exchange, as this raises issues of trust and professionalism, as already been identified (Greysen et al., 2010; Mansfield et al., 2011; Snyder, 2011; Quist, 2011). On the other hand, administrative staff, having ‘looser’ connections with healthcare system ‘clients’ may be more eager to be engaged in more participatory applications.

4.2 Limitations

In this paper, the initial findings of an exploratory study on the use of social media by the Greek healthcare professionals were presented. The current survey was not without limitations. Its main limitation regards the non – representativeness of the sample, a common issue of all online surveys (Eysenbach and Wyatt, 2002). Nevertheless, this limitation was partially restricted through the data weighting process. Additionally, since this was the first attempt to record social media use among health professionals, the issue of representativeness was not considered as of first priority.

Finally, it was anticipated by authors that those who tend to respond to online questionnaires are internet-oriented anyway, thus providing stronger support to conclusions and implications of the survey.

References

- American Association of Orthopedic Surgeons (AAOS) Practice Management Committee (2012) ‘*Social Media in Healthcare. A Primer for Orthopedic Surgeons*, Soyer, A. (Ed.). Available online at: http://www3.aaos.org/member/prac_manag/Social_Media_Healthcare_Primer.pdf#page=17 (accessed on 6 July 2012).
- Archambault, P.M., Légaré, F., Lavoie, A., Gagnon, M.P., Lapointe, J., St-Jacques, S., Poitras, J., Aubin, K., Croteau, S. and Pham-Dinh, M. (2010) ‘Healthcare professionals’ intentions to use wiki-based reminders to promote best practices in trauma care: a survey protocol’, *Implementation Science*, Vol. 5, No. 45. Available online at: <http://www.implementationscience.com/content/5/1/45> (accessed on 8 November 2011).

- Apostolakis, I., Daras, T. and Stamouli, M.A. (2009) *Exercises in Applied Statistics in Health Sector*, 2nd Vol., Papazisis Publishers, Athens.
- Apostolakis, I., Kastania, A. and Pierakou, C. (2003) *Statistical Data Processing in Health Sector*, Papazisis Publishers, Athens.
- Apostolakis, I. and Stamouli, M.A. (2006) 'Validity and reliability assessment of quantitative research questionnaires in health units: the case of a questionnaire concerning the evaluation of a nursing services management information system of a hospital', *Statistical Review*, Vol. 2, No. 1, pp.3–25.
- Apostolakis, I. and Stamouli, M.A. (2007) *Exercises in Applied Statistics in Health Sector*, 1st Vol., Papazisis Publishers, Athens.
- Bello, I.S., Arogundade, F.A., Sanusi, A.A., Ezeoma, I.T., Abioye-Kuteyi, E.A. and Akinsola, A. (2004) 'Knowledge and utilization of information technology among health care professionals and students in Ile-Ife, Nigeria: a case study of a University Teaching Hospital', *Journal of Medical Internet Research*, Vol. 6, No 4, p.45.
- Biermann, J.S., Golladay, G.J. and Peterson, R.N. (2006) 'Using the internet to enhance physician-patient communication', *The Journal of the American Academy of Orthopaedic Surgeons*, Vol. 14, pp.136–144.
- Boulos, M.N.K., Maramba, I. and Wheeler, S. (2006) 'Wikis, blogs and podcasts: a new generation of Web-based tools for virtual collaborative clinical practice and education', *BMC Medical Education*, Vol. 6, No. 41. Available online at: <http://www.biomedcentral.com/1472-6920/6/41> (accessed on 8 November 2011).
- Burns, R. (2000) *Introduction to Research Methods*, Sage Publications, London.
- Carmines, G.E. and Zeller, A.R. (1979) *Reliability and Validity Assessment*, Sage Publications Inc, USA.
- Chou, W.S., Hunt, Y.M., Beckjord, E.B., Moser, R.P. and Hesse, B.W. (2009) 'Social media use in the United States: implications for health communication', *Journal of Medical Internet Research*, Vol. 11, No. 4. Available online at: <http://www.jmir.org/2009/4/e48/> (accessed on 8 November 2011).
- Christakis, N.A. and Fowler, J.A. (2009) *Connected: The Surprising Power of Our Social Networks and How They Shape Our Lives*, Little, Brown and Company, New York.
- Corley, C.D., Cook, D.J., Mikler, A.R. and Singh, K.P. (2010) 'Text and structural data mining of influenza mentions in web and social media', *International Journal of Environmental Research and Public Health*, Vol. 7, No. 2, pp.596–615.
- DeVries, P. (2012) 'Electronic social media in the healthcare industry', *International Journal of Electronic Finance*, Vol. 6, No. 1, pp.49–61.
- Dunn, J. (1974) 'Well separated clusters and optimal fuzzy partitions', *Journal of Cybernetics*, Vol. 4, pp.95–104.
- eMarketer (2010) *More Time Spent on Social Media than Email Worldwide*. Available online at: <http://www.emarketer.com/Article.aspx?R=1008025> (accessed on 12 October 2011).
- Eysenbach, G. and Wyatt, J. (2002) 'Using the internet for surveys and health research', *Journal of Medical Internet Research*, Vol. 4, No. 13. Available online at: <http://www.jmir.org/2002/2/e13/> (accessed on 20 October 2011).
- Eysenbach, G. (2008) 'Medicine 2.0: social networking, collaboration, participation, apomediation, and openness', *Journal of Medical Internet Research*, Vol. 10, No. 3. Available online at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2626430/> (accessed on 8 November 2011).
- Freeman, L.C. (2004) *The Development of Social Network Analysis: A Study in the Sociology of Science*, Empirical Press, Vancouver.
- Gallos, P., Daskalakis, S., Liaskos, J., Katharaki, M. and Mantas, J. (2010) 'Student beliefs on Health 2.0 technology: an empirical study amongst nursing undergraduates', *ICICTH 2010: Proceedings of the 8th ICICTH Samos: International Conference on Information Communication Technologies in Health*, Samos, Greece, pp.171–183.

- Giustini, D. (2006) 'How Web 2.0 is changing medicine', *British Medical Journal*, Vol. 333, pp.1283–1284.
- Greysen, S.R., Kind, T. and Chretien, K.C. (2010) 'Online professionalism and the mirror of social media', *Journal of General Internal Medicine*, Vol. 25, No. 11, pp.1227–1229.
- Gwee, S. (2011) '6 P's of social health', *Social Media Club Reporter*. Available online at: <http://socialmediacub.org/blogs/from-the-clubhouse/6-ps-health> (accessed on 8 November 2011).
- Grisot, M. and Vassilakopoulou, P. (2011) 'Challenges in institutionalising electronic platforms for patient-healthcare provider communication', *International Journal of Electronic Healthcare*, Vol. 6, Nos. 2–4, pp.138–152.
- Henrikson, J.U. (2011) 'The growth of social media: an infographic', *Search Engine Journal*. Available online at: <http://www.searchenginejournal.com/the-growth-of-social-media-an-infographic/32788/> (accessed on 8 November 2011).
- Iloudi, S., Lazakidou, A. and Tsironi, M. (2010) 'Information and communication technologies for better patient self-management and self-efficacy', *International Journal of Electronic Healthcare*, Vol. 5, No. 4, pp.327–339.
- Jones, R., Sharkey, S., Smithson, J., Ford, T., Emmens, T., Hewis, E., Sheaves, B. and Owens, C. (2011) 'Using metrics to describe the participative stances of members within discussion forums', *Journal of Medical Internet Research*, Vol. 13, No. 1. Available online at: <http://www.jmir.org/2011/1/e3/> (accessed on 8 November 2011).
- Kaplan, A.M. and Haenlein, M. (2010) 'Users of the world, unite! The challenges and opportunities of Social Media', *Business Horizons*, Vol. 53, No. 1, pp.59–68.
- Keckley, P.H. and Hoffman, M. (2010) *Social Networks in Health Care: Communication, Collaboration and Insights*, Issue Brief, The Deloitte Centre for Health Solutions. Available online at: http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/US_CHS_2010SocialNetworks_070710.pdf (accessed on 12 October 2011).
- Kietzmann, J.H., Hermkens, K., McCarthy, I.P. and Silvestre, B.S. (2011) 'Social media? Get serious! Understanding the functional building blocks of social media', *Business Horizons*, Vol. 54, No. 3, pp.241–251.
- Kortum, P., Edwards, C. and Richards-Kortum, R. (2008) 'The impact of inaccurate Internet health information in a secondary school learning environment', *Journal of Medical Internet Research*, Vol. 10, No. 2, p.17.
- Koulakoglou, K. (1998) *Psychometrics and Psychological Evaluation*, Ellinika Grammata, Athens (in Greek).
- Kovic, I., Lulic, I. and Brumini G. (2008) 'Examining the medical blogosphere: an online survey of medical bloggers', *Journal of Medical Internet Research*. Available online at: <http://www.jmir.org/2008/3/e28/> (accessed on 6 July 2012).
- Lewis, D. (2011) 'The multidimensional role of social media in healthcare', *Interactions*, Vol. 18, No. 4, pp.17–21.
- Lloyd, S.P. (1982) 'Least squares quantization in PCM', *IEEE Transactions on Information Theory*, Vol. 28, No. 2, pp.129–137.
- Lupianez-Villanueva, F., Mayer, M.A. and Torrent, J. (2009) 'Opportunities and challenges of Web 2.0 within the health care systems: an empirical exploration', *Informatics for Health & Social Care*, Vol. 34, No. 3, pp.117–126.
- Mansfield, S.J., Morrison, S.G., Stephens, H.O., Bonning, M.A., Wang, S.H., Withers, A.H., Olver, R.C. and Perry, A.W. (2011) 'Social media and the medical profession', *Medical Journal of Australia*, Vol. 194, No. 12, pp.642–644.
- Martikainen, S., Viitanen, J., Korpela, M. and Lääveri, T. (2012) 'Physicians' experiences of participation in healthcare it development: willing but not able', *International Journal of Medical Informatics*, Vol. 81, No. 2, pp.98–113.

- McNab, C. (2009) 'What social media offers to health professionals and citizens', *Bulletin of the World Health Organisation*, Vol. 87, No. 8. Available online at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2733259/?tool=pubmed> (accessed on 6 October 2011).
- Nordqvist, C., Hanberger, L., Timpka, T. and Nordfeldt, S. (2009) 'Health Professionals' attitudes towards Using a Web 2.0 Portal for child and adolescent diabetes care: qualitative study', *Journal of Medical Internet Research*, Vol. 11, No. 2. Available online at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2762803/> (accessed on 6 October 2011).
- Quist, N. (2011) 'Social media and interpersonal relationships: for better or worse?', *The Journal of Clinical Ethics*, Vol. 22, No. 2, pp.191–193.
- Sarasohn-Kahn, J. (2008) 'The wisdom of patients: health care meets online social media', *iHealth Reports*. Available online at: <http://www.chcf.org/~media/MEDIA%20LIBRARY%20Files/PDF/H/PDF%20HealthCareSocialMedia.pdf> (accessed on 6 July 2012).
- Sechrest, R.C. (2010) 'The internet and the physician-patient relationship', *Clinical Orthopaedics and Related Research*, Vol. 468, No. 10, pp.2566–2571.
- Smith, A. and Smith, A. (2011) 'Gender perceptions of smoking and cessation via technology, incentives and virtual communities', *International Journal of Electronic Healthcare*, Vol. 6, No. 1, pp.1–33.
- Snyder, L. (2011) 'Online professionalism: social media, social contracts, trust, and medicine', *The Journal of Clinical Ethics*, Vol. 22, No. 2, pp.173–175.
- Terry, M., (2009) 'Twittering healthcare: social media and medicine', *Telemedicine and e-Health*, Vol. 15, No. 6, pp.507–510.
- Usher, W. (2011) 'Types of social media (Web 2.0) used by Australian allied health professionals to deliver early twenty-first-century practice promotion and health care', *Journal of Social Work in Health Care*, Vol. 50, No. 4, pp.305–329.
- Van De Belt, T.H., Engelen, L.J., Berben, S.A.A. and Schoonhoven, L. (2010) 'Definition of Health 2.0 and Medicine 2.0: a systematic review', *Journal of Medical Internet Research*, Vol. 12, No. 2. Available online at: <http://www.jmir.org/2010/2/e18/> (accessed on 6 October 2011).
- Vance, K., Howe, W. and Dellavalle, R.P. (2009) 'Social internet sites as a source of public health information', *Dermatologic Clinics*, Vol. 27, No. 2, pp.133–136.
- Viitanen, J., Nieminen, M., Hyppönen, H. and Lääveri T. (2011) 'Finnish Physicians' experiences with computer-supported patient information exchange and communication in clinical work', *International Journal of Electronic Healthcare*, Vol. 6, Nos. 2–4, pp.153–173.
- Ward, R., Moule, P. and Lockyer, L. (2008) 'Adoption of Web 2.0 Technologies in education for health professionals in the UK where are we and why?', Paper presented at the *7th European Conference on e-Learning*, 6–7 November, Agia Napa, Cyprus.
- World Health Organization (2009) *Milestones in Health Promotion, Statements from Global Conferences*. Available online at: http://www.who.int/entity/healthpromotion/Milestones_Health_Promotion_05022010.pdf (accessed on 6 October 2011).

Websites

- <http://epatientdave.com/about-dave/>
- <http://www.va.gov/bluebutton/>
- <http://www.epsos.eu/epsos-services/future-services.html>
- <http://www.hl7.org>
- <http://www.cs.waikato.ac.nz/ml/weka/>