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The Web 2.0 and Social Media Technologies for Pervasive Health Communication: Are they Effective?[1]

Web 2.0 and social media applications are popular communication channels and are frequently utilised by individuals and organizations in many sectors and markets. While they are widely recognised as having good potential for reaching large population segments in an efficient way, little is known about their effectiveness in influencing behaviour change. The aim of this paper is to analyse the available literature, examining papers that report outcomes associated with social media used in health communication initiatives. Specifically, it aims to understand what topics are being addressed, what types of social media are used, what types of outcomes are measured, and if they are effective in changing health behaviours. A scoping review was conducted for papers published from January 2005 to May 2010. Twenty-three papers reported outcomes of health communication initiatives using social media. Findings suggest that more research isolating the effects of social media on health-related behaviours is needed.

Keywords: Web 2.0, social media, health communication, effectiveness.

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1. Introduction

In the last few years, the use of social media and Web 2.0 applications (including blogs, wikis, podcasts, social networking sites, etc.) has increased worldwide, reaching millions of people. Organisations and individuals use these new technologies in many aspects of their daily activities, both online and off-line. Social media represent attractive and advantageous means of communication, because they allow messages to be delivered to large segments of society in a timely, cost-effective and efficient way.

Social media applications can be classified in five main categories: (1) *blogs* or online journals, (2) *social networking sites* (e.g., Bebo, Facebook or MySpace), (3) *content communities,* focused on the sharing of particular types of content (e.g., YouTube and Vimeo for video content, Flickr for pictures, Wikipedia for encyclopaedic content), (4) *forums/bulletin boards,* built around a specific interest or topic and organised in threads and forum posts; and (5) *content aggregators,* applications that allow users to fully customise and organise the content they select and wish to access, such as RSS feeds (Constantinides & Fountain 2008).

From a communication theory point of view, social media have contributed to a shift from a traditional top-down and centred online communication paradigm to a more complex many-to-many-to-many model (Della et al. 2008). This view resembles the concepts outlined in other models, such as the two-way symmetrical model, developed by James Grunig and colleagues (Grunig 1989; 2000), and the Multidirectional Communication Model (MDC), proposed by Thackeray & Neiger (2009). Grunig's two-way symmetrical model is deemed efficacious in resolving conflicts and promoting mutual understanding and respect between one organisation and its publics. This model allows organisations to establish and maintain good, long-term relationships with their publics, fostering trust and credibility. The Multidirectional Communication Model combines a traditional vertical top-down communication process (one-to-one) with a bottom-up horizontal process (one-to-many or many-to-many). This consumer-centred framework shows that the individual is both exposed to and actively involved in the communication process, while being immersed in both a traditional and new media envi-

ronment. On one side, consumers actively seek information; on the other, they are continuously exposed to large amounts of data and information (top-down, vertical expert-generated and bottom-up user-generated). At the same time, users can participate in the horizontal process of information sharing (Thackeray & Neiger 2009).

Social media tools may help achieve the ultimate goal of health communication, which is a "multifaceted and multidisciplinary approach to reach different audiences and share health-related information with the goal of influencing, engaging and supporting individuals, communities, health professionals, special groups, policy makers and the public to champion, introduce, adopt, or sustain a behaviour, practice or policy that will ultimately improve health outcomes" (Schiavo 2007: 7). From this health communication perspective, social media can serve as helpful tools in reaching different audiences and influencing behaviour change as the technology allows for more advanced, customised, personalised or tailored interventions (see Suggs 2006; Rimer & Kreuter 2006).

It is probably too early to discuss a dramatic paradigm shift in communication. However, it is clear that Web 2.0 requires a thoughtful re-evaluation of communication strategies and innovative ways of developing and delivering behaviour change initiatives (Thackeray & Neiger 2009).

1.1. Trends in Social Media Use

According to Universal McCann's social media tracker, in 2008, there were 475 million active social media users worldwide, in 2009 approximately 625 million, and in 2010 more than 700 million global users (Smith 2008; Parker 2009; Parker & Thomas 2010). Social media are mainly accessed for social networking, but other uses have been widely adopted. In 2009, about 307 million people visited a friend's social networking page and 272 managed their own profile on a social networking site; 394 million watched video clips online, and 346 million read blogs (Parker 2009). In 2010, blogs and social networking sites accounted for one in every four and a half minutes online (NielsenOnline 2010) and Facebook became the biggest social networking website in terms of subscribed users, reaching 500 million users (Facebook 2011). Another important daily activity for both teens and adults is micro-blogging (i.e.,

Twitter) and status updating, which have replaced the once-popular blogging (Lenhart et al. 2010).

1.2. Social Media Uses in Health Communication Initiatives

In the non-profit and public health sector, social media are more frequently integrated into programmes and campaigns aimed at promoting behaviour change. For example, the U.S. Centres for Disease Control and Prevention use social media "to reinforce and personalize messages, reach new audiences, and build a communication infrastructure based on open information exchange," in order to provide users with access to "credible, science-based health information when, where, and how [they] want it" (CDC 2009: para. 1). Other examples of public health campaigns using social media include Flu.gov and AIDS.gov, aimed at increasing awareness about H1N1 flu and HIV testing respectively. Campaigns like the Swiss "Love Life Stop Aids" for AIDS/HIV prevention, the British "Be a Star" for breastfeeding initiation, and the U.S. tobacco counter-marketing campaign "truth" largely use social media tools to stimulate communication and conversations about the campaign itself.

These examples among various anecdotal stories found online suggest that decision-makers choose social media strategies because they are perceived to be effective. Additionally, literature reviews suggest that Web 2.0 applications can be efficacious in attracting, retaining, and engaging end users (Bennett & Glasgow 2009), because they can generate larger behaviour change effects while stimulating interpersonal communication about a campaign topic (Abroms & Maibach 2008). These considerations are implicitly or explicitly based on evidence showing that more user-centred, adapted or tailored communication interventions produce more positive outcomes than targeted or generalised ones (Smeets et al. 2007; Suggs & McIntyre 2007). From a psychological point of view, this can be explained using Petty & Cacioppo's (1981, 1984) Elaboration Likelihood Model (ELM) which suggest that tailoring a message to one's needs and characteristics should improve the perceived relevance of a given message, which should increase the likelihood that the message is deeply cognitively processed (via the central route of persuasion). This could lead towards a more sustained attitudinal change, which ultimately leads to a

behavioural change. Therefore, the more engaged the users are and the more adapted the message, the more likely behaviour change will occur.

1.3. Objectives and Research Questions

Considering the popularity and ubiquitous nature of social media and its possible implications for health communication research and practice, the purpose of this paper is to examine papers that report outcomes associated with social media used in health communication initiatives. Specifically, it aims to understand what topics are being addressed, what types of social media are used, why types of outcomes are measured, and if they are effective in facilitating health behaviour change. The findings will help to identify research gaps and to make recommendations for future research. The overarching research questions are:

1. What health topics are addressed in health communication initiatives that report outcomes associated with the use of social media?
2. What types of social media are used in health communication initiatives that report outcomes associated with the use of social media?
3. What types of outcomes are reported in health communication initiatives that report outcomes associated with the use of social media?
4. What evidence exists regarding the effectiveness of social media use for facilitating health behaviour change?

2. Method

A scoping review was conducted to systematically assess papers that reported outcomes of initiatives using social media for health communication (Arksey & O'Malley 2005). Similar to systematic reviews, scoping reviews allow for the methodological and systematic mapping of a certain body of literature (Brien et al. 2010), and are appropriate when the topic of research is new, complex, or yet undiscovered (Arksey & O'Malley 2005; Brien et al. 2010).

To maximize the inclusion of a wide range of data, papers and case studies were collected systematically using two approaches. First, a systematic

review of the literature was carried out in 22 databases through eight digital search engines. The databases included: ABI/INFORM Global and ABI/INFORM Trade & Industry (via ProQuest); Academic Search Complete (EBSCOhost); Arts & Humanities Citation Index (Web of Knowledge); BiomedCentral (Scirus); CINAHL and Communication & Mass Media complete (EBSCOhost); ERIC (CSA Illumina); GreenFILE (EBSCOhost); Health Source: Nursing/Academic Edition info, and Library, Information Science & Technology Abstracts (EBSCOhost); Medline/Pubmed (Scirus, CSA Illumina and Ovid Medline(R); ProQuest Sociology (ProQuest); PsychINFO and Psychology and Behavioral Sciences Collection (EBSCOhost); PubMed; Science Citation Index Expanded (Web of Knowledge); ScienceDirect; Social Sciences Citation Index (Web of Knowledge); Social Services Abstracts and Sociological Abstracts (CSA Illumina); The Cochrane Library database (Wiley Interscience).

The search included the keywords "social media," "web 2.0," "web2.0," "social software," "social web," "social comput*," "new media" in combination with the search phrases "social marketing," "health promotion," "health communication," "health education," "health campaign*," "health program" or "health initiative." Following Constantinides & Fountain's (2008) classification of Web 2.0 applications, the terms "blog*," "social networking sit*," "social networking websit*," "podcast*," "tagging," "wik*," were also included allowing for a wildcard search, where available. The names of the most popular and used social media applications mentioned in industry reports (Parker 2009; Parker & Thomas 2010) were also searched: Facebook, MySpace, YouTube, Twitter, FriendFeed, and Flickr. Searches were conducted using advanced search features where available. Boolean and proximity operators, exact match search in title, abstract and keyword fields were all used. In ProQuest the following subject fields were searched: health behaviour, health education, health promotion, public health education, social marketing, communications technology, communications technology and computers, and campaigns. In PubMed, the following MESH terms were also used: Blogging, Social Marketing, Public Health, Health Promotion, Health Education, Healthy People Programs, National Health Programs, Health Educators, Education, Public Health Professional.

Papers were retrieved if they were peer-reviewed, English-language papers, published between January 2005 and May 2010. January 2005 was selected as starting date because "social media" and "Web 2.0" search terms were not used before 2004 (see Google Trends). They also had to explicitly mention one of the "social media" keywords (i.e., web 2.0, social media, social computing, or the names of a social media application; e.g., "Facebook") in the title, abstract or keyword fields. Papers included met the aforementioned criteria in addition to reporting on impact of social media.

Second, a systematic search of papers from a relatively new, non-indexed peer-reviewed health communication journal, *Cases in Public Health Marketing,* which publishes papers on the use of new media in health communication was searched for all health communication papers using social media. The hand search of the journal *Cases in Public Health Communication & Marketing* was conducted because while the journal is not yet indexed in PubMed, it is a well-regarded source for papers describing innovative health communication initiatives. A search of the journal website archive of published papers was conducted using the terms "social media" and "web 2.0." All case studies presenting health communication initiatives that involved social media were retrieved. Papers were excluded if they described only the potential of social media or did not measure outcomes associated with the use of social media for the purpose of health communication.

3. Results

A total of 89 papers focused on health communication and social media or Web 2.0 were retrieved through the search of bibliographic databases. The majority of these were general papers recognising the potential of social media in health communication. Seventeen papers measured the impact of social media and were included in this review. The search of the journal *Cases in Public Health Communication & Marketing* produced six papers that reported outcomes of social media health communication initiatives. Thus, a total of 23 health communication initiatives were included in this review. Table 1 highlights the papers, topic of the initia-

tive, target audience, type of social media applications used, type of outcomes reported and the findings.

Table 1: Health Communication Publications that assessed the Impact of Social Media

ID	Citation	Health communication topic	Primary target audience	Type of media	Reported outcomes	Findings
Health Information						
1	Cozma 2009	Credibility of online sources and health myths	College students (Health comm. Class)	2 websites + blog	Perception of credibility, beliefs	Blog readers were significantly less likely to change their belief compared to both news websites and health organization's site readers. They rely more on personal sphere of influence, public and technical sources of information.
2	Hu & Sundar 2010	Health information seeking; source credibility	Undergraduate students	Website + blog	Perceptions about health information; behavioural intentions	Significantly greater behavioural intentions toward information attributed to a Web site than to a blog, a home page, or the Internet. Blogs and home pages were considered uncertain, less credible.
3	Schott 2005	Consumer health information	General population	Webcasts	Web metrics	More than 1,000 visits; positive qualitative appraisal of the resource by the users and visitors, especially from young users.
Heart Disease						
4	Taubenheim et al. 2008	Heart disease	Women with heart disease	Facebook, YouTube, Wikipedia, Flickr, blogs, social bookmarking sites	Web metrics; Campaign awareness	Web traffic; blogger outreach increased- more visits; increased awareness of the Red Dress Symbol.
HIV Prevention						
5	Hoff et al. 2008	HIV –AIDS prevention	Youth	Blog, MySpace	Web metrics; Service usage: quantitative data	More than 2,800 calls to the hotline and 19,000 visits to the website. Over the year, there were a total of 38,000 calls and 1.3 million visitors. The project was recognised with an Emmy Award for Best Broadband project for 2006/07.

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Hygiene						
6	Plourde et al. 2008	Pandemic flu prevention campaign (through hand washing)	General population	Mix of social media apps	Web metrics; Behaviour change	Increased number of visits of the campaign's website; Social media generated attention towards the topic, through virally spread videos and comments. Statistically significant increase in covering coughs, washing hands, and staying home when sick. Markets with heavier exposure to campaign materials reported larger increases in positive behaviour change.
Mental Health						
7	Hayward-Wright 2008	Alzheimer, dementia	Alzheimer's Australia NHW staff, health care workers; carers, family members; various stakeholders; the media	Blog, website, other services	Web metrics; Service usage: qualitative feedback	Increased number of website visitors; Website poll: 94% of the users find the service useful (low sample size). Positive qualitative feedback about the usefulness of the service.
Physical Activity						
8	Huhman 2008	Physical activity promotion	Pre-adolescents, children (tweens)	YouTube, interactive games	Web metrics; Product awareness	Increased number of site visitors across the years of the campaign, but it is not possible to relate the success to social media use only; When the campaign diminished, its awareness decreased.
Smoking Cessation						
9	Conrad et al. 2009	Smoking cessation	Youth	Facebook, blogs	Web metrics; Service usage: anecdotal feedback	Increased number of site visitors across the years of the campaign. Anecdotal positive feedback. Lowest smoking rate reported (however cannot be related to the campaign itself).
10	Li 2009	Smoking cessation	Young adults (16-24)	Text messaging, blogs	Web metrics; Service usage;	Increased number of blog posts during the campaign period; the registrations to quit line dropped, but services were only evaluated on the basis of usage, not quitting outcome.

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Sustainability						
11	Hamilton et al. 2008	Recycling	Young adults	YouTube blog/vlog, MySpace, Facebook, Flickr, Wikipedia, delicious	Web metrics	Increased number of visits, comments and contacts through social media; Increased reach of the campaign through social media.
12	Williams et al. 2008	Sustainable food practice	Adults	YouTube, blog/vlog, MySpace, Facebook, Flickr, Wikipedia	Web metrics	Increased number of blog subscribers, website visitors is associated with increased awareness of the topic, but no specific awareness measures were assessed.
Classroom Education						
13	Burke et al. 2009	Teaching health education	Health education faculty	YouTube	Perception of social media usefulness; Service usage: quantitative data	Half of the sample reported using YouTube in their classroom; perceived as effective learning tool, but not more effective than traditional tools; The 80% of non-users report positive impressions and interest.
14	El Tantawi 2008	Teaching dental education	First-year dental students	Blog	Attitudes; Behaviour change	Significant better results in quiz, mid-term, final exam and final grade of students who participated most on the blog. Positive attitude towards the use of blog in class and good satisfaction.
15	El Tantawi 2010	Teaching dental education	Postgraduate dental students	Blog	Attitudes; Behaviour change	Significant better results in the overall final grade of students who participated most on blog activities.
16	Goldman et al. 2008	Teaching public health (environmental health)	Public Health students	Blogs	Perception of social media usefulness; Attitudes towards the medium	60% find blogging experience enriching; Positive favourable attitudes of the students towards the medium. Students found easier to blog than collaborate in class.
17	Gwozdek et al. 2008	Teaching dental hygiene	Dental hygiene students	Blogs (mBlog, Uni Michigan platform), chat website, IM, cell phone txt messaging	Knowledge/ confidence level; Perception of social media usefulness	The use of mBlog judged effective for improving interaction with students; Improved confidence of using blogs. Chat was not useful and effective because of its synchronous format.

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18	Gwozdek et al. 2009	Teaching dental hygiene	Dental hygiene students	Blogs (mBlog, Uni Michigan platform)	Knowledge/ confidence level; Perception of social media usefulness	Qualitative data analysis of comments reveals that blogging helps relate didactic material with practice, improve student-patient interaction, and student collaboration; 77% think that blogging is valuable supplement to patient care experience.
19	Kapp et al. 2009	Teaching public health	Public health undergraduate students	YouTube	Web metrics; Perception of social media usefulness	Qualitative feedback about the course showed that the course should be offered to other students; Nr. of videos posted/viewed.
20	Lauber 2009	Teaching athletic training program	Clinical instructors	Wiki	Perception of social media usefulness	Positive feedback by the users; ease of use, convenience for working at distance
21	Oomen-Early & Burke 2007	Teaching health education	Undergraduate online women's health course students	Blog	Perception of social media usefulness	Overall high satisfaction with blogging; Positive opinions about its usefulness to increase interaction. High student engagement; Instructors perceived that student interaction was more than doubled.
22	Poonawalla & Wagner 2006	Teaching dermatology	Dermatologists	Blog	Web metrics; Perception of social media usefulness	Positive feedback and high perceived usefulness of the blog; No reported differences between student participating and non-participating in blogging interaction.
23	Walmsley et al. 2009	Teaching dentistry	Students of dentistry	Podcasts	Perception of social media usefulness	Positive rating of podcasts and favourable perceptions of their use in class.

3.1. Health Communication Topics addressed

The 23 papers addressed nine topics. The most common topic addressed was health-related classroom education ($n = 11$). The remaining topics included online health information seeking and credibility ($n = 3$), smoking cessation ($n = 2$), sustainability-related behaviours ($n = 2$), and heart disease, hygiene, mental health, physical activity and HIV prevention with one paper each. Target audiences varied, with the majority being

classroom education initiatives (IDs: 13–23) targeting students of different status, such as first-year bachelors or post-graduate students (IDs: 1, 2, 14–19, 21, 23), and one targeting faculty members (ID: 13). The remainder targeted the general population (IDs: 3, 6), health workers (ID: 7), young people (IDs: 5, 9), or adults (IDs: 10–12).

3.2. Type of Social Media used

In general, the majority of initiatives reported using blogs as the unit of analysis (IDs: 1, 2), tools used in educational settings (IDs: 14–18, 21, 22), or as instruments for promoting discussion about specific health campaigns (IDs: 4, 5, 9–12). Podcasts (IDs: 3, 25) were used for developing consumer health information resources or for teaching dentistry. YouTube was used mainly for enhancing the learning experience of health education faculty (ID: 13) and public health undergraduate students (ID: 19). A wiki was used as a supporting tool for an athletic training programme (ID: 20). A mix of various social media was used in several cases, especially in health communication campaigns, such as the *Heart Truth* (ID: 4), *the 5th Guy* (ID: 6), *RE3.org* (ID: 11), *Own Your* C (ID: 9), and *Sustainable table* (ID: 12). In these campaigns an official website was used as a repository of links to several campaign-related social media profiles and in particular, social networking sites: Facebook (IDs: 4, 9, 11, 12) and MySpace (IDs: 5, 11, 12). Profiles were mostly used to increase the reach of blog updates, news and pages from the official website. For the same purpose, micro-blogging platforms like Twitter and picture- or video-sharing sites (i.e., YouTube, Flickr, Picasa) were used as repositories for official ads, commercials or PSAs (see in particular *the 5th Guy* and the *Heart Truth* examples).

3.3. What Outcomes are measured?

As primary outcome measures many papers presented Web metrics (IDs: 3–12, 19, 22), resulting from keyword alerts or general Web analytics (e.g., Google Analytics, NetTracker). These outcomes mainly consisted of quantitative outreach and outputs (i.e., website page views, number of viewers, registered users, "friends" and followers). Service usage statistics

were also reported in several papers (IDs: 5, 7, 9, 10) as supporting evidence of the relative impact of the intervention.

The perceived usefulness of social media (being blogs, YouTube, Wiki or podcasts) was also frequently reported in papers (IDs: 1, 2, 13, 16–23). Two articles dealt with the role of perceived source credibility in disconfirming health myths (ID: 1), or in health-related information seeking (ID: 2). In the former, the authors compared beliefs in health myths using a blog, news website, and organisational website. In the latter, blogs were compared to websites, and credibility outcomes were associated with behavioural intentions towards information. Two other articles measured attitudes towards blogs used as learning tools (IDs: 14, 15)

3.4. What Effects do Social Media have on Health Behaviour Change?

Few studies tested or isolated social media in order to analyse behaviour change. The paper about *the 5th Guy* campaign (ID: 6) reported statistically significant results (i.e., increase in covering coughs, washing hands, and staying home when sick). Moreover, markets with heavier exposure to campaign materials reported larger increases in positive behaviour change. One randomised controlled trial (ID: 2), examined the direct and combined influences of original information sources and selecting information sources on perceived credibility of and behavioural intentions towards health information. The study found significantly greater behavioural intentions toward information attributed to a Web site than to a blog, a home page, or the Internet. They showed that participants (undergraduate students) were less likely to change their behavioural intentions based on information sourced from home pages and blogs than from general health information Web sites. Blogs were sources associated with uncertainty and lack of credibility. However, authors did not assess actual behaviour change.

Two classroom education studies (ID: 14, 15) found statistically significant differences in the final grades of students who interacted more on the instructor's blog compared to those who did not interact on the blog. The health myths experiment (ID: 1) showed that blog readers were significantly less likely to change their beliefs compared to those who read both news and health organization's Web sites.

4. Discussion

One major finding of this review is that many articles published in peer-reviewed journals consist of general overviews celebrating the potential of social media in health communication initiatives. Twenty-three articles were based on original research data and reported outcomes of initiatives and only five reported effects on health behaviour change.

Regarding the reported outcomes, results show that few peer-reviewed studies tested and isolated social media in order to analyse specific outcomes (i.e., attitudinal or behaviour change, awareness increase). The reported outcomes mainly consist of quantitative outreach and outputs (i.e., website page views, number of viewers, registered users, "friends" and followers). The number of page views, followers, likes or friends on a social networking profile are important output measures, yet represent just the starting point of a thorough evaluation of the impact of a campaign or intervention.

Two studies (Plourde et al. 2008; Hu & Sundar 2010) tried to associate the use of social media with behaviour change, by comparing pre- and post-test measures. Even though *the 5th Guy* intervention produced a statistically significant impact on behaviour, the social media component was not effectively isolated. Also, the only randomised controlled trial (RCT) in the sample failed to effectively link social media use to behaviour change, focusing just on behavioural intentions. Moreover, the population studied in the RCT consisted of undergraduate students, so the results should be interpreted with caution. Students are not representative of the general population or patient groups and have their own motives for participating in university-based social media studies (e.g., course credit, mandatory part of class assignments) that are not necessarily transferable to other groups.

5. Conclusion

This review highlights an important research gap in the study of social media applications for health communication interventions. Despite a growing body of literature on the topic, there remains limited evidence of the effectiveness of social media on health behaviour change.

More efforts are required in order to carefully design and plan health communication interventions that incorporate social media, so that an understanding of their effects can be realised. Future research should isolate the effect of social media, using various experimental designs that allow analysis of the influence of the interactivity between users on health behaviour change.

These findings represent a call to action for health communication researchers. There is a need to measure social media, analyse content and conversations and design vigorous studies, which allow for the comparison of social media use with traditional media channels. A challenge in such research is that online social media systems are in perpetual development, so health communication intervention research designs need to account for interventions that are fluid and change frequently and in many cases, change many times each day or even each hour.

This review found that while more and more health communication initiatives use social media and show great promise, little is known about their effects beyond reach and use. The future of social media use in health communication should prove innovative and interesting. Whether social media has any impact remains to be illustrated.

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