Routledge
Taylor & Francis Group

# Using Web 2.0 Technologies to Enhance Evidence-Based Medical Information

MIRIAM J. METZGER AND ANDREW J. FLANAGIN

Department of Communication, University of California, Santa Barbara, Santa Barbara, California, USA

*This article invokes research on information seeking and evaluation to address how providers of evidence-based medical information can use Web 2.0 technologies to increase access to, enliven users' experiences with, and enrich the quality of the information available. In an ideal scenario, evidence-based medical information can take appropriate advantage of community intelligence spawned by Web 2.0 technologies, resulting in the ideal combination of scientifically sound, high-quality information that is imbued with experiential insights from a multitude of individuals. To achieve this goal, the authors argue that people will engage with information that they can access easily, and that they perceive as (a) relevant to their information-seeking goals and (b) credible. The authors suggest the utility of Web 2.0 technologies for engaging stakeholders with evidence-based medical information through these mechanisms, and the degree to which the information provided can and should be trusted. Last, the authors discuss potential problems with Web 2.0 information in relation to decision making in health contexts, and they conclude with specific and practical recommendations for the dissemination of evidence-based health information via Web 2.0 technologies.*

Searching for health information online is increasingly common (Fox, 2010). As early as 2005, more than one quarter of Internet users in the United States dealing with a major illness or medical problem said that the Internet played a crucial or important role in their decision making, an approximately 50% increase from 2002 (Horrigan & Rainie, 2006). It is estimated that 60–80% of American adults have looked online for health information, including comments, ratings, or reviews provided by patients and consumers themselves (Fox, 2008, 2009).

Despite this reliance on web-based health information, consumers face a difficult task, as illustrated by a few common scenarios. Consider, for example, the case of a woman who gets a mammogram and is told by her physician that there are abnormalities in the tissue that require further tests (which may even place her at greater

risk of cancer) and possibly surgery. Or, consider the case of new parents who struggle to determine whether immunizing their infant will place him or her at risk for developing autism. In both situations, it is likely that these people will turn to the Internet to help them understand their diagnosis or treatment options and to gather information to make health and medical decisions (Fox, 2008; Hesse et al., 2005). What they will find is a vast array of information that varies widely in its relevance to their particular situation and in its point of view, specific recommendation, and source. An initial Google search for the term *breast cancer*, for example, returns more than 66 million results; the term *vaccine safety* produces nearly 5 million hits.

Included in these search results are personal and professional blogs, online discussion forums, personal web pages, social networking sites, academic journals, various kinds of encyclopedias, and commercial websites offering physicians' advice, product recommendations, and patients' opinions. The sources of this information will range from renowned experts with impressive medical credentials, to pharmaceutical companies advocating the use of their product, to patients who have personally experienced these conditions, courses of treatment, and medications firsthand. In addition, some of this information will consist of opinions on the basis of personal experiences with various health problems or on experiences helping patients in clinical settings, whereas other information may rest on findings from the medical research community. For patients facing medical decisions, these online information sources must also be integrated with information coming from several offline sources, including one's doctor, other healthcare professionals, and family and friends. It is clear that making sense of the wealth of information available today can be a daunting task.

Given the complex landscape of web-based health information, how do healthcare professionals and patients navigate this environment to find relevant and credible information? How do they locate information that is most valuable in their medical advice giving or decision making? Evidence-based medical information can be particularly useful in helping people make health-related decisions because it offers systematic overviews of clinical investigations using respected scientific methodology, which can then be used in evaluating treatment options and making health care recommendations. As evidence-based medical information increasingly migrates online, an important question is how patients, policymakers, and clinicians manage this environment to obtain needed information for health care decisions. Related to this, in what ways can progressively interactive online applications such as those facilitated by Web 2.0 technologies help to engage these stakeholders in the effective use of evidence-based medical information?

In this article, we use research on information seeking and evaluation to address these questions. We argue that people are most likely to engage with information that they can access easily, and that they perceive as (a) relevant to their information-seeking goals and (b) credible. To assess the extent to which evidence-based medical information available online meets these criteria, and the degree to which it can better respond to contemporary demands of information consumers, we examine the usefulness of Web 2.0 technologies in general, and the role of user-generated content for engaging stakeholders with evidence-based medical information in particular. We then discuss potential problems or issues with Web 2.0 information in relation to decision making in health contexts, and we conclude with specific and practical recommendations for the dissemination of evidence-based medical information.

## The Contemporary Media Environment and the Problem of Information Abundance

Until recently the enormous cost and complexity involved in producing and disseminating information limited the number and nature of information providers, who generally had substantial investment in either the information itself or in the apparatus required to deliver it. Digital network technologies, however, have lowered the cost of information production and dissemination, and thus increased the sheer amount of information and number of information sources available. In this environment, the challenge for all information providers, including those in the medical and health fields, has shifted from overcoming problems associated with the cost of information production and distribution to a problem of capturing the limited attention of target audiences. Research exploring this issue in cognitive psychology, communication, and information science indicates that attention is most likely to be given to information that is accessible, relevant, and perceived as credible by information seekers.

### *Information Accessibility*

By virtue of resources such as the Web, information consumers today are faced with more choices, greater variety, and more ready access to information than at any time previously. In such information-abundant environments, it is easy for information seekers to feel overwhelmed by the many choices available and, paradoxically, to feel that appropriate information is inaccessible given this overload. Consequently, people's use of information hinges on its easy and ready accessibility (e.g., Chen & Hernon, 1982; O'Reilly, 1982), which reaches beyond mere information availability.

A common strategy to cope with information-rich environments is to *satisfice*, which is an information processing strategy that operates on the principle of least effort (Simon, 1956). By satisficing, people do not use all of their cognitive resources to evaluate each option at every opportunity in order to obtain optimal outcomes. Instead, they use just enough resources to provide a sufficiently optimal outcome for the specific information seeking context. Satisficing accounts, for example, for the tendency for people to stop information searches before examining all options (see Prabha, Connaway, Olszewski, & Jenkins, 2007).

Consistent with this, studies show that online information seekers rarely use vigorous information-processing strategies. For example, few online information seekers go beyond the first or second page of search results, even when highly motivated, as is common in health information searches (Morahan-Martin, 2004). Information consumers often favor strategies that minimize their cognitive effort and time as a means of coping with information overload and uncertainty (Gigerenzer & Todd, 1999; Pirolli, 2005; Sundar, 2008; Taraborelli, 2008; Wirth, Bocking, Karnowski, & von Pape, 2007). Hence, satisficing is an attractive strategy of Internet information seekers (see Pirolli, 2005).

In light of the information-abundant context in which information seekers now routinely operate, coupled with satisficing methods of information selection, the accessibility of information is key to its use and usefulness. Information accessibility consists of two characteristics: its discoverability and comprehensibility. First, accessible information is that which is easy to locate and ascertain, and thus accessibility is necessarily tied to the perceptual prominence of information in online

contexts. Second, information is only accessible to the extent that users are able to comprehend and interpret it. Consequently, information producers must consider carefully ways in which they craft, position, and disseminate their information to maximize its accessibility to target audiences. This is true for health information in particular, which is proliferating quickly online and is often highly technical in nature.

## *Information Relevance*

The concept of relevance has a long history in the field of information science, which argues that information is judged as useful by the extent to which it is relevant to an information seeker's search goals (see Barry, 1994; Saracevic, 1970). As originally conceived by Saracevic (1970), relevance referred to the match or correspondence between a user's informational needs and the information retrieved from a system. Given the enormous and wide-ranging information resources available through Internet- and web-based tools today, locating the most relevant information can be a significant challenge.

A number of tools are designed specifically to meet this challenge by facilitating the retrieval of relevant information. Most notable, of course, is the search engine, which is designed to sort through the vast information repositories currently available and present only the most relevant among these to the user. In theory, search engines and related tools achieve information relevance by matching a user's particular query to appropriately relevant information.

Although search engines achieve this goal admirably, returning from among the billions of potential options a relatively small subset of alternatives with incredible speed, results can often lack precision, particularly when information needs are esoteric. For example, relevance in the context of online health information seeking depends not only on the correspondence between information seekers' stated needs and retrieved information, but also on the degree to which users believe the retrieved information is pertinent and applicable to their personal health circumstances. Thus, health or medical information that is overly broad may be perceived as inapplicable to a user's own situation, and thus deemed irrelevant and readily dismissed, even though it is of high quality and matches a particular search query well. Relevance, then, is not merely a function of matching query terms to a database of information through sophisticated algorithms, but is rather a subjective judgment on the part of an information seeker (Barry, 1994; Rees & Saracevic, 1966) about how well the retrieved information matches one's unique or particular circumstances.

From the perspective of the information producer, achieving relevance can also be a considerable challenge, which is met to the degree that people's queries result in the particular information they wish to obtain. Effective audience targeting can help to achieve this, and can be enhanced by tools that align information producers' content with information seekers' goals. For example, HTML metatags (which provide additional or specific keyword descriptions of a webpage's content) can help to refine the results of web searches, targeted placement or marketing of materials can help to increase information relevance, and links to and from web pages associated with evidence-based medical information reports can enhance the specificity of search engine results. In each case, the goal is not to enhance page rank in search engine results (most major search engines ignore metatag information, for example), but rather to reduce the mismatch between information sought by consumers and

information provided by producers. From the information producers' perspective, relevance is achieved not by popularity but by locating the appropriate audience.

### Information Credibility

Even if information is accessible and relevant, it will only be used if it is also perceived to be credible. *Credibility* is traditionally defined as the believability of information, and it rests largely on the trustworthiness and expertise of the information source or message, as interpreted by the information receiver (Hovland, Janis, & Kelley, 1953). In communication and persuasion research, credibility is key to message acceptance. Many studies find greater attitude change and behavioral influence from messages stemming from high-credibility sources (for overviews, see Albarracin & Vargas, 2010; Self, 2009). Information scientists tend to focus on the credibility of information rather than of sources, and link credibility to information use (Rieh & Danielson, 2007). For example, work in this discipline finds that perceptions of credibility explicitly and implicitly affect the selection and usage of information resources (Savolainen, 2007).

Digital media, however, are complicating notions of credibility (see Metzger, Flanagin, Eyal, Lemus, & McCann, 2003). By increasing access to information and to the tools required to provide it, digital media allow for a tremendous number of information sources with varying levels of expertise. As a result, much of the information available online is not and cannot be vetted by professional gatekeepers. Moreover, whereas credibility was once granted by these gatekeepers largely on the basis of the source's credentials and official authority, the interactive nature of digital media provides widescale access to information from uncredentialed and unknown sources.

Yet, despite their relative lack of official authority to provide information, these sources may possess expertise given their firsthand knowledge or experience with a topic or situation, and may be accurately perceived by others as having a great deal of what may be called *experiential credibility* (Flanagin & Metzger, 2008; see also Wilson, 1983). Accordingly, Metzger, Flanagin, and Medders (2010) noted that traditional credentialed expertise is currently challenged by the ability of the Internet and Web 2.0 "to aggregate individuals' experiences or opinions, pool their information, and identify the expertise of 'nonexperts' based on specific or situated knowledge" (p. 436). For example, people's direct experiences with a particular medical treatment option, which can be easily collected and presented through a host of online venues today, might be perceived as tremendously credible and influential, even though this information originates from a number of untrained, uncredentialed individuals, rather than from an authoritative and established medical expert. Thus, in the contemporary digital media environment, credentialed expertise stands beside rather than on top of other forms of authority, including experiential credibility. In this way, noncredentialed forms of authority gain credence given the unique features of digitally networked media. These shifts in the nature of information provision make the determination of information and source increasingly complex and uncertain.

Credibility in information-seeking situations is obviously important in its own right, especially in health contexts where the quality of information seems crucial to effective decision making. However, information credibility is also important in that it is intricately linked to information relevance as well. Information science regards credibility as a key aspect of information relevance; credibility is conceptualized as

a criterion for information seekers' judgments concerning the relevance of information (Rieh & Danielson, 2007). This means that information that is not perceived as credible is considered irrelevant to fulfilling an information seeker's goals, and thus is not selected (see Saracevic, 1970). This further suggests that information must be perceived as credible if it is to be used. Studies find that people rely on perceived quality as a criterion for selection or rejection of information resources (Park, 1993; Wang & Soergel, 1998).

So far, we have argued that the current information environment affords a multitude of health information options for information seekers, and that only that information that is highly accessible, relevant to users and their specific needs, and perceived as credible will be of particular use to them. Health information providers, therefore, must attend to these factors when creating and disseminating information online, so that their information can rise above the din of competing sources to influence decision making in positive ways. One way to achieve this is through the informed use of Web 2.0 technologies, including social media, interactive online tools, and user-generated content.

## Using Web 2.0 to Overcome Problems of Accessibility, Relevance, and Credibility

Web 2.0 technologies encompass a large class of information and technological tools, including, for example, blogs, wikis, social bookmarking, social networking sites, and a range of ratings, recommendation, reputation, and credentialing systems. Implicit in all of these tools is the notion of *user-generated content*, wherein a great deal of the information available online today originates from individual users' knowledge, experiences, and opinions. With the aid of these tools, individuals can engage in widescale communication, collective resource building, and collaboration (Fox, 2009). Our focus in this article is on how user-generated content in particular can be used to increase access, relevance, and the perceived credibility of evidence-based health and medical information.[1]

### Access

Web 2.0 and its social media applications have resulted in the provision of tremendous repositories of personal health information. Bernhardt and colleagues (this issue) argue that aspects of Web 2.0 technologies, including their high level of interactivity, capacity for deep user engagement, and extensive reach, make them a particularly attractive and potentially effective channel for disseminating health information to consumers. Hesse and colleagues (this issue) similarly point out that Web 2.0 tools offer information seekers an "architecture of participation" that facilitates and encourages users to find, use, create, and share content with each

---

[1]Health and medical Web 2.0 applications abound. Examples include health wikis (e.g., Medpedia); health-focused social networking sites (e.g., PatientsLikeMe, Trusera) and support groups (e.g., Daily Strength, Rareshare); health social bookmarking (e.g., PeerClip); ratings and reviews of healthcare providers and organizations (e.g., iMedix, Vivu); electronic health record repositories (e.g., CureTogether); disease mapping via data mining of Google searches (e.g., Google Flu Trends), Twitter (e.g., Flu Tweets), and other data platforms (e.g., Health-Map, SickCity); health video-sharing websites (e.g., icyou.com) and podcasts; health-focused blogs; and health topic-based groups within virtual communities such as Second Life.

other. In this way, social media have the capacity to enhance the dissemination of health-related information around the globe.

People appear to be participating by providing their personal resources to health information repositories and by accessing others' information. Fox (2009) found that a majority of those who have looked for health information online access user-generated health information by reading someone else's commentary or experience about health or medical issues on an online news group, website, or blog (41%); by consulting rankings or reviews online of doctors or other health care providers (24%) or of hospitals or other medical facilities (24%); by signing up to receive updates about health or medical issues (19%); or by listening to a podcast about health or medical issues (13%). Another recent nationally representative survey of Internet users found that 8% used online communities or social networks for health information, 4% used video-sharing sites to find health information, 20% had read or posted a comment on a health-related blog, and 22% read or posted a comment in an online forum or message board.[2]

Not only do social media technologies provide additional distribution channels for existing information repositories, including those containing evidence-based medical information, but they also provide reliable means for information diffusion given that they oftentimes propagate through networks of personal contacts of known and trusted others. This sort of propagation can be highly effective, in that information transmitted and directed to users from trusted and known members of one's social network may be noticed and used more readily than information from unfamiliar sources. Moreover, this type of propagation serves as a heuristic means to evaluate information in an abundant information environment, whereby people determine information credibility via endorsement from known and trusted others (see Metzger et al., 2010). As such, it is a highly effective form of information satisficing.

The enormous and growing popularity of Web 2.0 and social media sites such as Facebook and Twitter further underscore the potential for increasing access to information that is made available via networks. Today's social networks already count close to one billion members worldwide. Facebook, the most popular social network system, has more than 500 million active users (Sorkin, 2010), and has surpassed Google as the most visited site on the Internet (Yarow, 2010). Facebook and Twitter are increasingly replacing e-mail and search engines as users' primary interfaces to the Internet (Gannes, 2010; Kirkpatrick, 2009).

### Relevance

Web 2.0 technologies and user-generated content in particular may be used to enhance the relevance of evidence-based medical information as well, because users themselves can participate in its refinement and offer feedback to maximize its usefulness to other health information seekers. One prominent form of evidence-based medical information is called *comparative effectiveness research* (also called *patient-centered outcomes research*) and its translation products, which offer patients, health care providers, and policymakers overviews of medical research findings concerning the effectiveness of treatment options for various health conditions. Although

---

[2]These data come from an as-yet-unpublished dataset, through a survey conducted by Knowledge Networks, recently collected by the authors.

potentially very helpful in clinical decision-making settings, this information has been criticized for providing rather generic summaries of highly complex information. For example, the treatment recommendations made are often somewhat one-size-fits-all recommendations in that they tend to show what treatments are most effective for most people most of the time. As such, they do not adequately address certain patient subgroups and their specific needs.

The addition of user-generated content to these overviews, however, could not only expand access and enliven the information for users but also greatly increase its relevance to patient subgroups. As an example, consider the case wherein a certain type of treatment (e.g., pharmaceutical treatment vs. surgical treatment) is found in the literature to be superior in terms of overall patient outcomes, and thus it becomes the recommended option. Although this may serve many if not most patients well, there could be important boundary conditions that would lead to different recommendations for some patients (e.g., those who are pregnant, those who suffer from multiple conditions or take multiple medications). These qualifying or boundary conditions may not surface in the static comparative effectiveness summaries, either because they are overviews aimed at best practices across patient populations or because these conditions are unknown at the time the summaries are released. In either case, allowing users to participate in the creation and refinement of this information via Web 2.0 technologies not only increases its relevance to more diverse user groups, but also improves individuals' chances of making more informed and thus more effective medical decisions.

Individuals are in many cases in the best position to provide information that requires personal experience, intimate familiarity with medical treatment options, or esoteric understanding of a particular physical condition. Under these circumstances, individually experienced and contributed information has natural advantages over that provided by more official, credentialed, or static sources.

## Credibility

As noted earlier, an important dimension of information relevance is information *credibility*, because only credible information has value to information consumers. Information credibility is judged by users on the basis of (a) objective properties of the information, including features such as source expertise, message cues, information comprehensiveness, and accuracy (Metzger et al., 2003); and (b) subjective factors such as the professionalism or design of information, consistency of the information with one's preexisting opinion, and especially the degree to which the information has received social endorsement (Metzger et al., 2010). These subjective factors have been shown to be extremely important in assessing information credibility, at times not just complementing but also overriding purely objective indicators of credibility.

Because evidence-based medical information originates from reputable and credentialed sources, and is based on accepted scientific methods, it is highly credible in terms of its objective characteristics. However, user-generated content is a valuable tool to garner and display social endorsement of this information, and thus Web 2.0 technology can influence information seekers' subjective credibility judgments of evidence-based health and medical information. For example, social networking sites such as Facebook or Twitter might be used not only to disseminate evidence-based information to relevant audiences, but also to allow and encourage users to express

their opinion about the information (via comments and the "like" button, for instance). Similarly, social bookmarking and other endorsement sites (e.g., Digg.com, delicious.com) enable users to indicate the extent to which they endorse or recommend particular information sources. When network and endorsement mechanisms are combined, opinions are propagated to others among members of the network, who may then use them in formulating their own information credibility evaluations. Of course, such venues are agnostic about the valence of opinions, equally capable of promoting both positive and negative endorsements.

User-generated content can also enhance the credibility of evidence-based medical information by inviting and engaging users to contribute their own perspectives, whereby they can offer their experiential credibility to other information seekers. In the health field in particular, user-generated information enjoys certain advantages. For example, firsthand personal experience related to the use of evidence-based medical information from peers, coupled with tools that allow for widespread dissemination of this information and user experiences, may be perceived as not only more useful for patients and clinicians, but equally or perhaps even more credible given that it has scientific and personal endorsement (Eysenbach, 2008). Personal experience with a doctor, hospital, treatment, medication, and so on imbues the source with a form of expertise that is valued by patients facing similar diagnoses. Research finds that similarity to a speaker enhances perceptions of his or her credibility and, as such, this type of experience-based credibility may enhance the credibility of social and collectively authored repositories (Eysenbach, 2008).

In this way, evidence-based health and medical information that includes user-generated content can be viewed by its users as stemming not only from an authoritative source (medical researchers and government agencies), but also from real people who struggle with the same health problem and have faced the same types of decisions as they are facing. Thus, evidence-based health and medical information accessed via Web 2.0 technologies can gain credibility by offering (a) authoritative researcher- or government-produced information and (b) information from people who are fellow sufferers and thus possess experiential credibility. For those individuals or subpopulations that tend to be suspicious of government-issued information, this can be an especially useful way to increase the reach of evidence-based medical information.

While the foregoing suggests that there is great potential for Web 2.0 and user-generated content to enhance the accessibility, relevance, and credibility of evidence-based health and medical information, there are potentially serious problems with relying on these resources as well, as considered next.

## The Potential Pitfalls of User-Generated Health Information

Although Web 2.0-based technologies offer exciting promise for information access, relevance, and credibility, they can also be problematic. The unfiltered social web can result in the dissemination of information that is not reliable, and it can be difficult to undo damage from erroneous or biased information distributed via Web 2.0 technologies (see Hesse et al., this issue). In addition, with user-generated information, it may be unclear whether the information source is who or what is claimed, and whether the information is original or has been repurposed, and potentially altered, at some point. In such cases, biased information can become as much a part of the information environment as scientifically sound data. In the context of reports stemming from

comparative effectiveness and patient-centered outcome research, for example, information from a drug manufacturer could be surreptitiously supplied under the guise of user-generated content to counter evidence-based recommendations against that company's products, or to propel patients toward that company's products.

Moreover, user-generated mechanisms work best when a diversity of opinions are represented, when individual opinions are independent of others' influence, when community members are able to draw upon specialized local knowledge, and when the convergence of judgments within a community is facilitated (Surowiecki, 2005). Although these conditions are present in some online venues, they are by no means universal. Group processes are often subject to biases through processes of band-wagon effects, groupthink, and other problematic group dynamics (Forsyth, 2010).

For example, group opinion conformity can result from collective deliberation because individuals' judgments are often influenced by others' judgments. And, if biases are introduced early in the deliberative process, group dynamics such as the tendency toward social reaffirmation may end up perpetuating rather than challenging these biases. In the context of evidence-based medical information, for example, user-generated feedback that is idiosyncratic, erroneous, or biased could endure and be perpetuated well beyond its reasonable weight. In particular, if such misinformation is introduced early in the response stream, it could ultimately result in misinterpretations of evidence-based medical information that may result in faulty conclusions about its validity.

Compounding this problem is the notion that it is difficult for people to interpret users' experiential-based information correctly, absent knowledge about basic statistical principles such as sampling (Eysenbach, 2008). For example, recent research on user-generated commercial ratings shows that Internet users attend to the average star ratings for a product without also attending to the number of such ratings provided, potentially at the expense of critical information about the influence of a small number of opinions on the aggregate rating (Flanagin, Metzger, Pure, & Markov, 2011). Under such circumstances, people's ability to take appropriate advantage of user-generated information is clearly suboptimal.

Overall, arguments about the value of user-generated information are complex. On the one hand, there is evidence that information aggregated across a diversity of users can produce enhanced collective intelligence via the wisdom of crowds. On the other hand, it is also true that crowds are not always wise, particularly when band-wagons can develop easily such that popularity can trump quality, when talent is assumed to be equally distributed across all contributors, and when specific training and expertise of contributors are undervalued (Keen, 2007). In this manner, the "cult of the amateur" can inappropriately displace models of authority created and sustained long prior to the Internet's influence. The question thus becomes, How can we take advantage of the potential benefits of Web 2.0 technologies in ways that ensure the quality and credibility of user-generated health information and, thus, maximize our collective intelligence in health and medical decision making?

## Strategies for the Effective Use of Evidence-Based Health Information via Web 2.0 Technologies

Several factors contribute to the effective use of evidence-based health information in the digital media environment. Our focus has been on three critical criteria—access, relevance, and credibility—that combine to suggest how Web 2.0 technologies can

facilitate the effective implementation and use of evidence-based medical information. In this endeavor, there are significant opportunities and considerable challenges.

Regarding access, it is critical that in using Web 2.0 technologies to disseminate evidence-based medical information new efforts must not be entirely new—that is, rather than creating novel Web 2.0 applications, platforms, sites, or networks, those wishing to more effectively disseminate findings should leverage existing social networking platforms and applications. Put another way, success in improving access to evidence-based medical information is highly likely to hinge on providers using the tools that already exist, where people already habitually seek one another's input, advice, and information (e.g., establishing a presence on Facebook and Twitter), rather than designing entirely new tools to achieve these outcomes. The use of extant networks of contacts for information distribution underscores a cardinal rule of communication campaigns: the most effective communication channels are not necessarily novel—rather, they are those that take advantage of where people already habitually and routinely gather, share, and communicate with one another (Rice & Atkin, 2001).

In terms of information relevance, the use of Web 2.0 technologies provides certain advantages over more generic search mechanisms. For example, whereas search engines can suggest information resources efficiently and therefore serve as an entry level tool for locating relevant information, social media tools are in many cases better suited to reveal more highly focused, refined, and therefore more relevant information resources. As aspects of the Web become increasingly social (e.g., through the activation of social networks in information-seeking tasks), this capacity becomes progressively more important for providing the most highly relevant information.

A challenge to the provision of relevant information, however, is how initially to populate user-provided information on evidence-based medical information in venues where such feedback is accommodated. Although repositories that capture user information may be valuable given their high relevance, they are most useful only after a critical mass of users has already provided their unique information (Connolly & Thorn, 1990), which also encourages further information provision (Fulk, Heino, Flanagin, Monge, & Bar, 2004). The challenge is therefore to entice people to provide information in the early stages, in the absence of other contributions, because at that point information contributions are costly but not very beneficial (because there is little information other than one's own), and users are tempted to free-ride on others' information contributions (Fulk, Flanagin, Kalman, Ryan, & Monge, 1996). Strategies to entice user contributions might include seeding user-generated content with initial contributions, incentivizing contributions through reward systems (e.g., as Sermo.com does), or locating opinion leaders or other particularly prominent and central people to provide information and to invite their social networks to take part as well.

As user-generated information becomes more prominent, it is critical to accurately evaluate and determine information and source credibility. To counter the potential problems inherent in information that is provided by sources that often lack the credentials that have in the past signaled trustworthy information (e.g., user-generated content), information consumers must learn to distinguish between high- and low-quality information and sources. Doing so, however, is challenging given that credible information is often a matter of experiential credibility rather

than a function of more traditional signals such as authority. This is true in health contexts in particular wherein one's own experience fundamentally provides a certain level of veracity. Information and media literacy training programs are therefore critical in this endeavor.

In addition, to enhance both information relevance and credibility, evidence-based medical information can benefit from strategies specifically designed to guard against untrustworthy or irrelevant information. For example, expert moderation of open forums can serve to ensure that information is accurate, even though it is provided by people high in experiential credibility, but lacking traditional credentials or medical qualifications. In this manner, establishing a Web 2.0 presence need not be an all-or-nothing endeavor, and information providers can remain actively engaged in the conversation that is created, in order to continually ensure the credibility and appropriate use of evidence-based medical information.

## Conclusion

The presence and use of Web 2.0 technologies and user-generated content for health information suggest the enormous knowledge assets that reside in collectives and communities, which until recently remained largely untapped as a result of insurmountable coordination costs. On the one hand, these resources represent significant new benefits to health information consumers. On the other hand, however, they suggest serious threats to health and medical information, and the degree to which information thus provided can and should be trusted.

In this article, we have suggested how evidence-based health and medical information can emerge from a plethora of options to be appropriately relied upon by patients, policymakers, doctors, and other medical personnel. We have also addressed how evidence-based health information providers can leverage Web 2.0 tools such as user-generated content via existing social networks to increase access to, enliven users' experiences with, and enrich the quality of the information available. In an environment of information abundance that is crowded with a diversity of opinions and options, strategies that provide enhanced access to and use of high-quality evidence-based information are increasingly critical.

With the aid of Web 2.0 tools, individuals can better engage with evidence-based research and information that is accessible, relevant, and credible. Enhanced community intelligence can result, in which the knowledge base among a population of users with a shared interest grows according to individuals' collective resource contribution. If evidence-based medical reports can take appropriate advantage of such forms of community intelligence, the result could be the ideal combination of scientifically sound, high-quality information that is further imbued with personally relevant, experiential insights from a multitude of individuals. In many ways, this is the ultimate goal of digitally enhanced networked tools for information sharing, and should be a shared goal of those interested in providing the best possible resources for health care.

## References

Albarracin, D., & Vargas, P. (2010). Attitudes and persuasion: From biology to social responses to persuasive intent. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., Vol. 1, pp. 394–427). Hoboken, NJ: Wiley.

Barry, C. L. (1994). User-defined relevance criteria: An exploratory study. *Journal of the American Society for Information Science*, *45*, 149–159.

Bernhardt, J. M., Mayes, D., & Kreuter, M. W. (2011). Dissemination 2.0: Closing the gap between knowledge and practice with new media and marketing. *Journal of Health Communication*.

Chen, C., & Hernon, P. (1982). *Information seeking: assessing and anticipating user needs*. New York: Neal-Schuman.

Connolly, T., & Thorn, B. K. (1990). Discretionary databases: Theory, data, and implications. In J. Fulk & C. Steinfield (Eds.), *Organizations and communication technology* (pp. 219–233). Newbury Park, CA: Sage.

Eysenbach, G. (2008). Credibility of health information and digital media: New perspective and implications for youth. In M. J. Metzger & A. J. Flanagin (Eds.), *Digital media, youth, and credibility* (pp. 123–154). Cambridge, MA: MIT Press.

Flanagin, A. J., & Metzger, M. J. (2008). The credibility of volunteered geographic information. *GeoJournal*, *72*, 137–148.

Flanagin, A. J., Metzger, M. J., Pure, R., & Markov, A. (2011). User-generated ratings and the evaluation of credibility and product quality in ecommerce transactions. *Proceedings of the 44th Hawaii International Conference on Systems Science*, p. 1–10.

Forsyth, D. R. (2010). *Group dynamics* (5th ed.). Belmont, CA: Wadsworth.

Fox, S. (2008). *The engaged e-Patient*. Retrieved November 8, 2010, from http://www.pewinternet.org/Reports/2008/The-Engaged-Epatient-Population.aspx?r=1

Fox, S. (2009, June 11). *The social life of health information*. Retrieved November 8, 2010, from http://www.pewinternet.org/Reports/2009/8-The-Social-Life-of-Health-Information.aspx

Fox, S. (2010, July 16). *Crowdsourcing a survey: Health topics*. Retrieved November 8, 2010, from http://www.pewinternet.org/Commentary/2010/July/Crowdsourcing-a-Survey-Health-Topics.aspx

Fulk, J., Flanagin, A. J., Kalman, M., Monge, P. R., & Ryan, T. (1996). Connective and communal public goods in interactive communication systems. *Communication Theory*, *6*, 60–87.

Fulk, J., Heino, R., Flanagin, A. J., Monge, P., & Bar, F. (2004). A test of the individual action model for organizational information commons. *Organization Science*, *15*, 569–585.

Gannes, L. (2010). *When social replaces search, what can you do to monetize?* Retrieved October 29, 2010, from http://gigaom.com/2010/03/24/when-social-replaces-search-what-can-you-do-to-monetize

Gigerenzer, G., & Todd, P. M. (1999). *Simple heuristics that make us smart*. New York: Oxford University Press.

Hesse, B. W., Nelson, D. E., Kreps, G. L., Croyle, R. T., Arora, N. K., & Rimer, B. K. (2005). Trust and sources of health information: The impact of the Internet and its implications for health care providers: Findings from the first health information national trends survey. *Archives of Internal Medicine*, *165*, 2618–2624.

Hesse, B. W., O'Connell, M., Augustson, E. M., Chou, W. S., Shaikh, A. R., & Rutten, L. J. F. (2011). Realizing the promise of Web 2.0: Engaging community intelligence. *Journal of Health Communication*.

Horrigan, J., & Rainie, L. (2006). *When facing a tough decision, 60 million Americans now seek the internet's help: The Internet's growing role in life's major moments*. Retrieved July 22, 2010, from http://pewresearch.org/pubs/19/when-facing-a-tough-decision-60-million-americans-now-seek-the-internets-help

Hovland, C. I., Janis, I. L., & Kelley, J. J. (1953). *Communication and persuasion*. New Haven, CT: Yale University Press.

Keen, A. (2007). *The cult of the amateur: How today's Internet is killing our culture*. New York: Doubleday.

Kirkpatrick, M. (2009). *Social networking now more popular than email, report finds*. Retrieved August 12, 2010, from http://www.readwriteweb.com/archives/social_networking_now_more_popular_than_email.php

Metzger, M. J., Flanagin, A. J., Eyal, K., Lemus, D. R., & McCann, R. (2003). Credibility in the 21st century: Integrating perspectives on source, message, and media credibility in the contemporary media environment. In P. Kalbfleisch (Ed.), *Communication Yearbook 27* (pp. 293–335). Mahwah, NJ: Erlbaum.

Metzger, M. J., Flanagin, A. J., & Medders, R. (2010). Social and heuristic approaches to credibility evaluation online. *Journal of Communication*, 60, 413–439.

Morahan-Martin, J. (2004). How Internet users find, evaluate, and use online health information: A cross-cultural review. *Cyberpsychology & Behavior*, 7, 497–510.

O'Reilly, C. A. (1982). Variations in decision makers' use of information sources: The impact of quality and accessibility. *Academy of Management Journal*, 25, 756–771.

Park, T. K. (1993). The nature of relevance in information retrieval: An empirical study. *Library Quarterly*, 63, 318–351.

Pirolli, P. (2005). Rational analyses of information foraging on the Web. *Cognitive Science*, 29, 343–373.

Prabha, C., Connaway, L. S., Olszewski, L., & Jenkins, L. (2007). What is enough? Satisficing information needs. *Journal of Documentation*, 63, 74–89.

Rees, A. M., & Saracevic, T. (1966). The measurability of relevance. *Proceedings of the American Documentation Institute*, 3, 225–234.

Rice, R. E., & Atkin, C. (Eds.). (2001). *Public communication campaigns* (3rd ed.). Thousand Oaks, CA: Sage.

Rieh, S. Y., & Danielson, D. R. (2007). Credibility: A multidisciplinary framework. In B. Cronin (Ed.), *Annual review of information science and technology* (Vol. 41, pp. 307–364). Medford, NJ: Information Today.

Saracevic, T. (1970). The concept of ''relevance'' in information science: A historical review. In T. Saracevic (Ed.), *Introduction to information science* (pp. 111–151). New York: Bowker.

Savolainen, R. (2007). Media credibility and cognitive authority: The case of seeking orienting information. *Information Research*, 12(3). Retrieved November 8, 2010, from http://informationr.net/ir/12-3/paper319.html#che82

Self, C. (2009). Credibility. In D. W. Stacks & M. B. Salwen (Eds.), *An integrated approach to communication theory and research* (2nd ed., pp. 435–456). New York: Routledge.

Simon, H. A. (1956). Rational choice and the structure of the environment. *Psychological Review*, 63, 129–138.

Sorkin, A. R. (2010, June). *Facebook tops 500 million users*. Retrieved August 11, 2010, from http://dealbook.blogs.nytimes.com/2010/07/22/facebook-tops-500-million-users

Sundar, S. (2008). Technology and credibility: Cognitive heuristics cued by modality, agency, interactivity and navigability. In M. J. Metzger & A. J. Flanagin (Eds.), *Digital media, youth, and credibility* (pp. 73–100). Cambridge, MA: MIT Press.

Surowiecki, J. (2005). *The wisdom of crowds*. New York: Anchor.

Taraborelli, D. (2008). How the Web is changing the way we trust. In K. Waelbers, A. Briggle, & P. Brey (Eds.), *Current issues in computing and philosophy*. Amsterdam: IOS Press.

Wang, P., & Soergel, D. (1998). A cognitive model of document use during a research project. Study 1: Document selection. *Journal of the American Society for Information Science*, 49, 115–133.

Wilson, P. (1983). *Second-hand knowledge: An inquiry into cognitive authority*. Westport, CT: Greenwood Press.

Wirth, W., Bocking, T., Karnowski, V., & von Pape, T. (2007). Heuristic and systematic use of search engines. *Journal of Computer-Mediated Communication*, 12, 778–800.

Yarow, J. (2010). *Facebook was more popular in the U.S. than Google last week*. Retrieved October 30, 2010, from http://www.businessinsider.com/facebook-was-more-popular-in-the-us-than-google-last-week-2010-3