Research has shown that “Health 2.0” – that is, user-generated health information often featuring blogging (i.e., self-publishing) or collaborative editing tools known as wikis – is increasingly popular among health professionals, chronic disease sufferers and the general public (Giustini 2007; Seeman 2008). However, concerns persist over the alleged inaccuracy, bias and poor governance of self-published health websites, or blogs, where an author’s entries are usually placed in chronological order, much like a diary (Wikipedia 2008a).

Prominent members of the lay media have voiced criticisms of blogs. For example, one leading Canadian journalist recently noted in *The Globe and Mail* that “reporters who are trained and paid to do the often dry work of gathering facts and interviewing people … provide the news stories, and the news sites gather them up and the bloggers comment on them” (Smith 2008, April 3). This statement implies that reporters are more skilled, credentialed and objective; bloggers, it suggests, are mere commentators. In the context of health information, however, the research presented concludes that health blogs are positive tools that create meaningful, informed news and exchange for consumers and health professionals – at a level that exceeds the quality of popular newspapers. Expert health bloggers, that is, credentialed editors with subject matter expertise (subject matter experts, or SMEs), influence the course of opinion within professional and chronic illness communities rapidly and, as such, are innovation leaders.

The Rise of General Interest and Health Blogs
Despite the recent emergence of physician-monitored blogs – where editors often showcase their clinical credentials to readers – critics of blogs for health topics express deep concern that patients may come to rely on information sites whose editors and contributors have little in-depth knowledge and whose intent may be to sell products rather than to inform (Seeman 2008). In response to these legitimate concerns, this analysis evaluated the World Wide Web’s 50 most popular health-related English-language blogs – self-published, ongoing “dialogues” with readers who enjoy the opportunity to comment on the blog’s content (Wikipedia 2008a).

Whatever their focus, there are five main reasons why people maintain a blog (Nardi et al. 2004):

1. To provide opinions
2. To express deeply felt emotions
3. To form and maintain community forums
4. To articulate ideas through writing
5. To document lives online

Tim Berners-Lee, the inventor of World Wide Web, reportedly created the first blog in 1992 (Wikipedia 2008b). There are currently over 20 million active bloggers in the United States alone (Derbyshire 2008, September 15). Just two years ago, that number stood at 12 million, with 57 million adult Americans reading a blog regularly (Pew Internet and American Life Project 2006). Today, over 300,000 physicians and medical students have contributed to a health blog (Eiring 2008). *Blogosphere* is a colloquial term referring to all blogs and their linkages to other blogs. Blogs drove an increase of approximately 50 million new websites in 2007 (Netcraft 2007). From March 2003 to March
2007, the number of blogs on the World Wide Web grew from less than 1,000 to 78 million (Zimmerman 2007).

Based on a three-day review of Bloglines (March 10–13, 2008), it is evident (using systematized search phrases including my doctor and my diagnosis) that blogs containing some form of personalized health content constitute an ever-larger subset of new blogs on the web, a finding consistent with prior research showing that the most popular user-created communities on the most popular social networking sites, such as MySpace or Facebook, are today more concerned with chronic illness than with any other topic (Seeman 2008).

While blogs are gaining strength in numbers, newspapers are rapidly declining in influence. Fourteen of 21 European Union (EU) countries saw newspaper circulation decline in 2005; 16 of 20 EU countries saw major newspaper circulation decline from 2001 to 2005 (World Association of Newspapers 2008). Blogs are rapidly outstripping newspapers in importance and attention across many domains of information, and healthcare debates, taking place first on medical blogs, are later appearing in mainstream newspapers such as The New York Times (Giustini 2006). It is of significance that those few major national and international newspapers that have sustained or gained in paid circulation (online and in print) over the past five years, such as The Wall Street Journal, are those that have aggressively embraced “social software” tools such as blogging. Notably, The Wall Street Journal is the only mainstream media publication that produces a highly popular health blog (Table 1).

Blogs are the most common form of e-collaboration and are increasingly devoted to healthcare topics. Since patients and the general public visit these sites frequently, this analysis set out to assess the degree to which information postings on these sites were expert moderated, potentially influenced by industry sponsorship (both drug industry and general industry sponsorship) or influenced by other factors, notably political partisanship (especially in the case of health policy or health economics websites). Further, the analysis sought to assess the degree to which the blog demonstrably protected users’ personal health content and further sought to compare the degree to which popular health blogs published and commented on clinically relevant news as compared with popular Canadian newspapers. In sum, this research endeavour addressed the questions: Does the public naturally gravitate toward trustworthy, objective and credible self-published health blog content? Do health blogs offer readers objective information that provides privacy protection and is devoid of partisanship or industry influence?

**Research Methodology**

I calculated a score (out of 50) for the 100 most popular English-language health blogs as recorded by three major blog content aggregators – Google, Bloglines and Technorati. To ensure accuracy, I cross-referenced my findings with a popular aggregator of popular health blogs, edrugsearch.com. I also calculated a raw “traffic density” score for the 100 most popular blogs. For the top 100 blogs, I identified, using the web-tracking service Alexa.com, the three-month average “traffic rank” based on web “reach” – which is an aggregate measure of the number of page views and users on the blog site (Alexa Internet, Inc. 2007). After identifying these numerical values, I reviewed the top 100 health blogs to describe each blog’s creators and editors; the extent to which the blog included industry advertisements – and, specifically, prominent drug industry advertising, which may be perceived to bias the objectivity of the content; and the blog’s editorship – that is, whether the blog was moderated by clinicians or SMEs on an ongoing or partial basis. Also of interest was the degree to which the home page of the blog site

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1 Following the analysis completed for this paper, The New York Times health blog has grown in popularity and, as of writing, is the only other mainstream English-language newspaper with a health blog ranked in the top 10 in user popularity.

---

**Table 1. Fifteen most highly used health-related blogs**

<table>
<thead>
<tr>
<th>Blog Rank</th>
<th>Site Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BadScience.net</td>
</tr>
<tr>
<td>2</td>
<td>Medgadget.com</td>
</tr>
<tr>
<td>3</td>
<td>Wall Street Journal Health Blog</td>
</tr>
<tr>
<td>4</td>
<td>Sharpbrains.com</td>
</tr>
<tr>
<td>5</td>
<td>Kevin M.D. Medical Weblog</td>
</tr>
<tr>
<td>6</td>
<td>Diabetesmine.com</td>
</tr>
<tr>
<td>7</td>
<td>The Health Care Blog</td>
</tr>
<tr>
<td>8</td>
<td>NHS Blog Doctor</td>
</tr>
<tr>
<td>9</td>
<td>Junkfood Science</td>
</tr>
<tr>
<td>10</td>
<td>World of Psychology and Mental Health</td>
</tr>
<tr>
<td>11</td>
<td>Awful Plastic Surgery</td>
</tr>
<tr>
<td>12</td>
<td>Running a Hospital</td>
</tr>
<tr>
<td>13</td>
<td>Pharma Marketing Blog</td>
</tr>
<tr>
<td>14</td>
<td>Emergiblog</td>
</tr>
<tr>
<td>15</td>
<td>Polite Dissent</td>
</tr>
</tbody>
</table>

*As of March 10, 2008.
displayed prominent privacy protection codes for users of the blog, that is, did the blog make clear how any personal information submitted by the user was to be used and protected?

Lastly, I compared popular health blogs to popular Canadian newspapers with respect to their diligence in reporting what clinical experts considered to be “medical news that matters.” I did this by systematically examining health blog and newspaper coverage of the 10 most important medical news stories of 2007 as defined by a consensus of clinical expert advisors across North America, compiled by Medscape and WebMD (Swint 2007) (Table 2). The 10 Canadian newspapers used for comparison were the 10 most widely read English-language newspapers in 2007 (Media in Canada 2007).

Upon review of the top 100 health blogs, it became clear that the top 50 health blogs were more directly concerned with clinical content than were the blogs ranked 51–100 (which were still health-related in orientation but less clinically focused). Using all the aforementioned variables of interest, I calculated a blog governance score out of 20 for each of the top 50 health blogs (Table 3). Statistical tests using SPSS (Version 13.0) were run on the data for these top 50 blogs to examine the presence or absence of any significant correlations of interest among the variables. For example, was higher traffic density positively associated with a lack of industry sponsorship? Each blog’s governance score out of 20 was assessed separately by three independent reviewers (including me), and any discrepancies were resolved by consensus among the reviewers.

Findings

Newspaper Coverage of Important Clinical News versus Health Blogs

Canada’s most widely read major newspapers are outperforming health blogs on reporting important clinical content. However, both newspapers and health blogs are performing poorly in this regard. Major Canadian newspapers (on average) covered just 37% of what clinical experts considered critically important medical news in 2007. By comparison, the most popular 50 health blogs, on average, covered just 23% of these stories. However, these averages obscure important findings. When isolating general interest health blogs – a minority of the top 50 health blogs, most of which cater to a particular illness, such as diabetes or autism – one finds that, in all instances, these general interest blogs fare at least as well as and usually significantly better than general interest newspapers in reporting critical

### Findings

#### Table 2. The 10 most important medical news stories of 2007

<table>
<thead>
<tr>
<th>Description of the Medical News Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>New guidelines for the management of lower back pain</td>
</tr>
<tr>
<td>Soft drink consumption linked to increased metabolic risk</td>
</tr>
<tr>
<td>New guidelines for treatment of acute ischemic stroke</td>
</tr>
<tr>
<td>New guidelines for venous thromboembolism diagnosis</td>
</tr>
<tr>
<td>New approach to Tdap vaccine for adults</td>
</tr>
<tr>
<td>Immunization schedule change recommendations for children and adults</td>
</tr>
<tr>
<td>Rosiglitazone (Avandia) increases MI and CV death in meta-analysis</td>
</tr>
<tr>
<td>NSAIDs for heart disease patients</td>
</tr>
<tr>
<td>Fish oil added to statin therapy reduces risk for major coronary events</td>
</tr>
<tr>
<td>Parkinson’s disease drugs linked to valvular dysfunction</td>
</tr>
</tbody>
</table>


N.B. Table 3. Blog governance scoring algorithm

<table>
<thead>
<tr>
<th>Criterion of Interest</th>
<th>Maximum Points Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderated by trained clinicians/SMEs related to the topic (e.g., a diabetes nurse educator in the case of a diabetes-focused blog); all SME credentials were determined by reviewing editor/author biographies posted on the blog site</td>
<td>2</td>
</tr>
<tr>
<td>Lack of general industry sponsorship (as demonstrated through advertisement on home page)</td>
<td>2</td>
</tr>
<tr>
<td>Lack of drug industry sponsorship (as demonstrated through advertisement on home page)</td>
<td>2</td>
</tr>
<tr>
<td>Prominently displayed code (either on the home page or linked from the home page) making users confident in the privacy protection offered to users of the blog (e.g., HONcode principles displayed)</td>
<td>2</td>
</tr>
<tr>
<td>Lack of political or plainly partisan editorializing by editor on drug topics or health policy topics</td>
<td>2</td>
</tr>
<tr>
<td>Number of the top 10 medical stories of 2007 posted (and discussed in blog-threaded discussions)</td>
<td>10</td>
</tr>
</tbody>
</table>

HONcode = Health on the Net Foundation code of conduct; SME = subject matter expert.

Also revealing is the overall performance of the 50 leading health blogs, as compared with popular newspapers, on the governance criteria measured in this analysis. The vast majority (>90%) of these popular health blogs lack drug industry sponsorship or overt partisanship that is readily detectable by the user. By comparison, drug industry sponsorship of events (other than direct-to-consumer advertisements) is not uncommonly seen in Canadian newspapers; and all major newspapers in Canada offer overt partisan commentary on health and medical issues on the editorial page – the “official voice” of the newspaper – and these editorials are usually written by anonymous editorial writers who rarely possess any clinical credentials.

As Figure 1 illustrates, health blogs can stand to do a better job of avoiding general industry sponsorship and offering users clear confidence regarding the privacy of user-submitted content. By comparison, newspapers fall down entirely on these scores, with no major newspapers in Canada prohibiting industry sponsorship or providing prominent assurances to letter writers (online or in print) that their submitted health content will be kept private in a manner that observes the Health on the Net Foundation code of conduct (HONcode) or equivalent privacy practices. Finally, 60% of the most popular health blogs are moderated partially or fully by SMEs, usually practising clinicians. The same cannot be said of major Canadian newspapers, whose health reporters and editors seldom have any clinical or graduate-level credentials in any health-related field. In many cases, newspapers do not have dedicated health editors.

**Blog Governance Score Inversely Linked to User Traffic**

There appears to be an inverse link between a blog’s governance score out of 20 and user traffic (i.e., user views) \( (p < 0.05, \text{analysis of variance}) \) (Figure 2). My interpretation, which is supported by a scan of the popular blogs’ content, is that some blogs are a “mile wide and an inch deep.” A high governance score, under my algorithm, is dependent on comprehensive coverage of important clinical news; however, many popular blogs, such as diabetesmine.com, cover particular topics intensely and, as a result, win greater loyalty from users. This suggests that blogs must generally be niche oriented in order to “get eyeballs sticking to the site” (also referred to as “stickiness”).

Supporting this point is the observation that the comprehensiveness of content coverage for clinically relevant news is negatively correlated with traffic density (Figure 3) \( (p < 0.05, \text{Student’s } t\text{-test}) \).

Again, the findings in Figure 3 show that the most popular health blogs are not those that are all things to all people. The reality is that the majority (>70%) of web users who seek out health information, including physicians, go to Google first for generic health information (Mayer 2007) and then may or may not land on a health blog. The people who trust the most popular health blogs and those who return to these blogs on a daily or weekly basis are those who are deeply connected, for personal or family reasons, to the illness or content focus of the blog.

**The Power of SMEs**

SME moderation does make a substantive positive difference to the quality of health blogs – in terms of governance and user popularity. Overall, good governance scores, once corrected for confounding variables, are positively tied to SME editorship \( (p < 0.001, \text{Student’s } t\text{-test}) \) (Table 4). This is a finding that appears to be true in the discipline of economics, where PhD, university-based economists linked to leading universities are,
based on my observation, the individuals who publish the blogs that enjoy the widest audiences with the greatest number of external contributions from users. Simply put, demonstrable expertise matters; for this reason, medical bloggers are, as one Medicine 2.0 conference participant put it, the “new OpEd writers” (McCabe Gorman 2008).

The Impact of General (Non-pharmaceutical) Industry Advertisements
Based on the method by which industry advertisements were coded in this particular analysis, there was no indication that drug advertisement negatively affected a blog’s governance score. At the same time, however, prominent general industry advertisement (i.e., non-pharmaceutical) was correlated negatively with the comprehensiveness of clinically relevant content (Figure 4) \( p < 0.05 \), Student’s \( t \)-test).

Discussion
As noted in Figure 4, blogs that contain generic industry advertisements do not tend to have as much medically relevant content. This is distinct from the association of specific drug industry ads, which, by themselves, do not seem to impair the relevance of the posted clinical content. What this may suggest is that I isolated the wrong variable to investigate. The variable of interest should likely be that reasonable users need to have good confidence that industry ads, of whatever type, will not undermine the relevance or objectivity of the blog’s content. This can potentially be achieved by accredited user privacy codes and conflict-of-interest position statements that are prominently displayed on the blog’s home page. By itself, the mere presence or absence of advertise-
ments cannot be said to be determinative of the quality of governance displayed by the blog. Future research, however, will need to critically evaluate the qualitative content of user-submitted posts to assess whether blogs that do contain advertisements of any type somehow suggest evidence of industry bias.

The overriding message of this analysis is that blogs have changed the notion of an “innovation leader” or “opinion leader.” Trusted sources are shifting. Social network analysis – the study of how “nodes” of people link together on social networks and blog communities – proves that “opinion leaders” do not always enjoy hierarchical authority (Cross et al. 2001). Popular health blogs, which earn trust through the loyalty of their readers and the power (and sustained accuracy) of their content, are run by SMEs; these SMEs are now the emerging idea drivers of innovation.

One strategically timed blog post, describing a new surgical “pearl of wisdom” or case finding – and published on a leading, trusted medical blog – may offer the world immediate insights into the quality and effectiveness of new care paths and protocols. In the past, ideas leaders, be they newspaper columnists or industry magnates, owed their status as leaders to their fealty to the editor-in-chief’s or chief executive officer’s world view. Figure 5 shows communication patterns among physicians discussing new medical treatments in this new world (Krebs 2008). The eye instinctively looks to the nodes that have many spokes. The node with the most arrows coming in (so-called in-degrees) is physician 048. However, some people may have lots of links but little influence. This is analogous to a person on popular social networking sites Facebook or LinkedIn, who may have 1,000 “friends” or “contacts”; however, this same person may have very little real influence as compared with a person with just 50 virtual friends but whose opinions have a great impact on those virtual friends. In other words, it is the strength of links that matters, not just the number. In the same way, it is the strength and loyalty of blog subscribers – those who keep coming back – that establish the longevity and innovation capacity of a particular health blog.

Conclusions

Based on this analysis, I can summarize some general observations that predict the innovation power of a health blog. First, a blog’s niche may drive high loyalty and use. Second, SME monitoring and contributions are positively linked to strong blog governance and, similarly, drive higher usage and loyalty patterns. Although the influence of lay newspapers is dwindling and popular health blogs are displaying stronger governance features, blogs can learn much from newspapers. As the proposed strategy framework I illustrate in Figure 6 demonstrates, strong governance features alone will not result in a patient-centred blog that enjoys sustained public interest and usage. Borrowing from my observations about the attributes of successful newspapers and magazines, I offer a proposed strategic framework for a long-lasting patient-centred health blog.

The proposed framework shown in Figure 6 suggests that, beyond the good governance practices examined in this analysis, content accountability (e.g., providing e-mail addresses for content authors) and journalistic best practices (e.g., correcting errors transparently) are important. From a patient perspective, news that people care about is “always local”; as such, blog readers want information to navigate their local continuum of care, and to connect with others who may share their medical condition or symptoms. Although this analysis demonstrates that partisanship is not synonymous with an innovative or quality health blog, community engagement tools – the ability to use information on blogs to advocate for change in concert with others who share one’s concerns – appear to be an important feature of many popular blogs. Finally, driving stickiness on a blog requires the same fundamental qualities that drive continued readership in any medium – elegance, wit and style.
Inside the Health Blogosphere: Quality, Governance and the New Innovation Leaders

Figure 5. Blogs are tools to lead opinion based on earned trust and respect

See text for details regarding this illustration.

Figure 6. Proposed framework for a patient-centred health blog

SME = subject matter expert.
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