

Toward a typology of health 2.0 collaboration platforms and websites

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Abstract During the past decade, the proliferation of social media has infiltrated various sectors of social and business communications. Of particular interest is the growth of health related websites and the healthcare sector's adoption of social media. In this paper, we develop a typology of Health 2.0 collaboration platforms and websites. Two major types of actors within Health 2.0 websites are health professionals (P) and health consumers (C). Each actor can serve as either support provider or support recipient. We focus on the six major Health 2.0 collaboration platforms including health blogs, physician-ratings, medicine-ratings, online health social networks, health discussion boards, and ask-a-doctor. We categorize these platforms into four major types including professional-to-professional (P2P), professional-to-consumer (P2C), consumer-to-consumer (C2C), and consumer-to-professional (C2P). Then, based on the combination of collaboration platforms provided by Health 2.0 websites, we categorize these websites into P2P, P2C, C2C, and C2P types. We describe each type and utilize the typology to investigate 20 Health 2.0 websites and the collaboration platforms they provide. Our typology can be used as groundwork for future research on health social media.

Keywords Health 2.0 · Medicine 2.0 · Health social media · Virtual health communities · Collaboration platforms · Typology

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1 Introduction

The proliferation of social media affects various aspects of business and social communications. Considering the growing role of social media, of particular interest is the healthcare's adoption of different social media [1]. The emergence of the Internet with its myriad health-related websites provides a wealth of information to patients and physicians. This has contributed to a transformation in patient-physician relationships [2, 3].

According to a survey conducted by Pew International Center, 80 % of the participants use the Internet to seek health information online [4]. These individuals seek health information from blogs, discussion boards, health-related virtual communities, and other sources of health information. Additionally, they tend to discuss health topics and often contribute their knowledge and experiences in discussion threads, in order to provide other users with helpful information as well as emotional support.

Health social media is facilitated by collaborative tools and interactive features. Thus, it is a form of Web 2.0 generation of Internet websites. Web 2.0 was first popularized by O'Reilly and revolutionized the Internet usage [5, 6]. The most common features among all Web 2.0 instances are collaboration features and tools. Blogs, discussion boards, and online social networks such as Facebook and MySpace are examples of Web 2.0 [7].

Web 2.0, and other 2.0 terms such as Enterprise 2.0 [8] and Library 2.0 [9] are increasingly referenced and used by practitioners and academicians. Accordingly, various 2.0 terms have been proposed and used in the context of health and wellness. Health 2.0, Medicine 2.0, and Physician 2.0 [10] are among the most common terms used for health social media [6, 10]. In this article, we use one of the most widely used terms, Health 2.0 [7]. Health 2.0 can be defined

as “the use of a specific set of web tools (blogs, podcasts, tagging, search, wikis, etc.) by actors in health care including doctors, patients, and scientists, using principles of open source and generation of content by users, and the power of networks in order to personalize health care, collaborate, and promote health education.” [10] P.5.¹

In recent years, the applications of Health 2.0 have grown dramatically. The Pew Research Center reported that approximately 18 % of their survey participants seek health information from other Internet users who have similar health issues or medical concerns [11]. Nonetheless, patients are not the only health consumers who use Health 2.0 services. Patients’ caregivers also seek health information online in order to help their patients manage their conditions [12]. Additionally, other Internet users who are willing to get health and wellness information can use Health 2.0 websites in order to communicate with other users and exchange their relevant knowledge and provide support for patients and caregivers. Within the context of Health 2.0 we define health consumers as *Internet users, including patients and caregivers (e.g., family members and friends), who go online in order to exchange health knowledge and experiences as well as emotional support through Health 2.0 websites.*

Health professionals are another group of actors within Health 2.0 websites [10, 12]. This group of Health 2.0 users includes medical practitioners, dental practitioners, pharmacists, ophthalmic opticians, and veterinarians [13]. Health professionals initiate health blogs (e.g., blogs on KevinMD.org) in order to provide useful information and tips for Internet users. Virtual health communities (e.g., DailyStrength.org) also welcome health professionals to serve their users by providing health advice and answer the questions posted by community members. Furthermore, they can join professional online communities (e.g., doximity.com) in order to share their knowledge and discuss medical cases, treatments, and other professional health topics. The results of a study completed by Manhattan research group revealed that 60 % of the surveyed American physicians were interested in using social networks for professional purposes [14]. Thus, Health 2.0 is also changing the way physicians enhance their professional knowledge through communicating with their colleagues.

Growing Internet users’ interests in using Health 2.0 tools has lead health organizations to engage actively in social media strategy [14]. As of October 9, 2011, more than 1200 hospitals and clinics in the United States had a social media presence including Facebook® fan pages, Twitter® profiles, or YouTube® channels [15]. Some health organizations even go beyond that and establish their own

virtual health communities. Mayo clinic, for example, has established Mayo clinic center for social media² to help patients interact with each other.

Health 2.0 tools and communication platforms have emerged in different forms and for different types of users. Although there is published research that discusses some of the Health 2.0 platforms and websites (see [16]), most of these papers do not develop or describe a typology that specifically focuses on Health 2.0 or health social media. We believe that development of a Health 2.0 typology can help to clarify this environment and contribute to future research efforts in this area.

The remainder of the paper is structured as follows. First, we present a review of literature on Web 2.0 and Health 2.0 typologies and implications. Second, we discuss the method we employed for this study. Third, we present our typology and discuss its specifications. Fourth, Health 2.0 categories will be analyzed and described. Fifth, we demonstrate the application of the typology by listing 20 Health 2.0 websites in terms of the categories of Health 2.0 platforms they are built upon. Last , we conclude by summarizing and discussing areas for future research using this typology.

2 Literature review

With the emergence of Web 2.0 services and virtual communities, researchers in various disciplines have directed their research efforts towards this phenomenon. Several scholars have developed classification frameworks, taxonomies, and typologies of social media and associated services and tools. Some typologies are proposed for classification of online communities in general [17]; whereas, other typologies have targeted social media in specific contexts [18, 19].

2.1 Typologies of web 2.0

Porter [17] developed a generic typology of virtual communities that is intended to be used by scholars in different disciplines. He argues that the previous categorizations of virtual communities were all one-dimensional; hence, applicable to a single disciplinary perspective. His typology is based on two broad dimensions: establishment and relationship orientation. Regarding the establishment factor, virtual communities are classified into two main categories: member-initiated and organization-sponsored. Based upon relationship orientation, Porter [17] categorizes member-initiated virtual communities into social and professional categories. In a similar vein, he divides organization-sponsored communities into commercial, non-profit, and government virtual communities.

¹ This definition is proposed for Medicine 2.0 in [10]. However, as they have mentioned in their article, Medicine 2.0 and Health 2.0 have been used interchangeably in the literature. Thus, we adopt this definition for Health 2.0 in this paper.

² [Http://www.connect.mayoclinic.org](http://www.connect.mayoclinic.org)

Porter [17] discusses five p-initiated attributes of virtual communities including purpose, place, platform, population interaction structure, and profit model. Purpose denotes the content of interaction or the reason a virtual community has been established. Place shows the extent to which the interactions among the members of a virtual community is mediated by technology. Platform pertains to the collaboration structure of the community that falls into three categories: synchronous, asynchronous, and hybrid. Population interaction structure refers to the group shape and architecture (e.g., small group or public communities) and the types of social ties (strong, weak, stressful). The last attribute proposed in this article is a profit model that describes the way a virtual community generates revenue. Porter's generic typology is extended by researchers in various disciplines and applied to more specific contexts such as virtual worlds [19].

In another study, Stanoevska-Slabeva and Schmid [20] distinguish two broad categories of virtual communities: discussion communities and task-and-goal oriented communities. According to their typology, discussion communities are intended to provide a communication platform for the user to exchange information related to a specific topic, whereas task-and-goal oriented communities are established for the user to accomplish a task cooperatively. In contrast to Porter [17], Stanoevska-Slabeva and Schmid [20] describe the categories in a distinct manner. They also sub-categorize each main category of virtual communities and discuss the supporting collaboration platforms for each type of community.

According to Stanoevska-Slabeva and Schmid [20], discussion communities fall into four categories: 1) discussion communities with direct person-to-person communication, 2) topic-oriented communities, 3) communities of practice, and 4) indirect discussion communities with indirect communications between members. The first category is defined and widely accepted as online social networks by the literature (see [20]).

Other researchers expand the categories of virtual communities that were introduced by Stanoevska-Slabeva and Schmid [20]. Dubé, Bourhis, and Jacob [21] propose a comprehensive typology of virtual communities of professionals. The main dimensions of their typology include demographics, organizational context, membership characteristics, and technological environment. They specify each category in terms of several attributes. For example, technological environment is specified in terms of degree of reliance on information communications technology (ICT) from low to high and ICT availability, from high to low. Dube et al.'s [21] typology, however, is only applicable to organizational virtual communities of professionals. Later, Hara et al. [18] extend the Dube et al.'s [21] typology to non-organizational contexts.

2.2 Typologies of health 2.0

Recent research efforts have focused on different characteristics of virtual communities within the context of health and wellness. Beijnum, Pawar, Dulawan, and Hermens [22] emphasize mobile virtual communities for telemedicine and discussed the different attributes and implications of this type of Health 2.0 services. They adopt Porter's [17] five attributes to characterize virtual communities for telemedicine. They also include the typology developed by El Moor and Kawash [23] for mobile virtual communities and the implications of this typology within the context of telemedicine.

In another study, Scandfeld, Scandfeld, and Larson [24] classify and discuss various collaboration tools and platforms used for health communications through online social media. Seven types of platforms proposed in this article include blogs, microblogs, social network websites, wikis, social news and bookmarking, user reviews, and photo/video sharing. The platforms and the examples provided for each platform in this list include both health-specific websites (e.g., WebMD.com) and general-purpose online social networks (e.g., Twitter and Facebook). The Scandfeld et al.'s [24] classification, however, does not cover a set of prominent collaboration platforms provided by Health 2.0 websites such as physician-rating, medicine-rating, and ask-a-doctor. A few years later, Schein, Wilson, and Keelan [25] add three more platforms including virtual worlds, news aggregators, and widgets/gadgets/badgets/buttons to the collaboration platforms proposed by Scandfeld et al. [24].

Other researchers have classified the applications of Health 2.0 platforms and websites. Weber-Jahnke, Williams, and Anissa [26] adopt a three-stage typology development methodology to categorize consumer health informatics applications and services into six broad categories: 1) information aids, 2) decision aids, 3) education aids, 4) management aids, 5) health sales services, and 6) meta/rating services. They argue that various forms of health social media tools and platforms can be utilized for specific consumer health informatics applications. For example, forums, online social networks, and chat rooms can be used for management aids which are defined as the ongoing long-term management of health and wellness. A summary of the typologies discussed in this section is provided in Table 1.

Despite considerable attention directed toward developing typologies of virtual communities in different contexts and at different levels, there is still not enough research that focuses on the categorization of Health 2.0 collaboration platforms and the health-specific websites that provide these platforms. Moreover, the existing classifications in the Health 2.0 context need an update for several reasons. First, they do not distinguish collaboration platforms from websites effectively, but focus merely on platforms (e.g., [24]) or

Table 1 A summary of the typologies of virtual communities proposed by the extant literature

Citation	Context	Categories/Types
[17]: Porter (2004)	Virtual communities (general)	Based on the two main dimensions (establishment and relationship-orientation) five major categories of virtual communities were proposed as follows: <ol style="list-style-type: none"> 1) Social member-initiated communities 2) Professional member-initiated communities 3) Commercial organization-sponsored communities 4) Non-profit organization-sponsored communities 5) Government organization-sponsored communities To further expand the typology, five attributes were also considered as: purpose, place, platform, population interaction structure, and profit model.
[20]: Stanoevska-Slabeva and Schmid (2001)	Virtual communities (general)	Two major types of virtual communities were identified: <ol style="list-style-type: none"> 1) Discussion communities (subcategorized into: discussion communities with direct person-to-person communication, topic-oriented, communities of practice, and indirect discussion communities with indirect communications) 2) Task-and-goal oriented communities
[21]: Dube, Bouhris, and Jacob (2006)	Organizational virtual communities of practice	Twenty-one structuring characteristics grouped into four major dimensions including demographics, organizational context, membership characteristics, and technological environment, along with different values for each characteristic were considered in their study of virtual communities of practice in the organizational context.
[18]: Hara, Shachaf, and Stoerger (2009)	Open online communities of practice	Twenty-three structuring characteristics including 21 characteristics similar to those in [21] as well as two characteristics new to this typology were grouped into the same major dimensions that Dube et al. [21] used. In this way, Hara et al. [18] extended the Dube et al.'s [21] typology to non-organizational contexts.
[22]: Beijnum, Pawar, Dulawan, and Hermens (2009)	Mobile virtual communities for telemedicine	Porter's 5p attributes including purpose, place, platform, population, and profit model were adopted to characterize different forms of mobile virtual communities for telemedicine.
[24]: Scanfled, Scanfled, and Larson (2010)	Collaboration tools and platforms used for health communications through social media - e.g., Twitter	Seven major types of collaboration platforms that can be offered by socially-enabled websites were identified: <ol style="list-style-type: none"> 1) Blogs 2) Microblogs 3) Social network websites 4) Wikis 5) Social news and bookmarking 6) User reviews 7) Photo/video sharing
[25]: Schein, Wilson, and Keelan (2011)	Social media in healthcare	The following three categories were added to the Scanfled et al.'s [24] typology. <ol style="list-style-type: none"> 1) Virtual worlds 2) News aggregators 3) Widgets/gadgets/badgets/buttons
[26]: Weber-Jahanke, Williams, and Anissa (2011)	Consumer health informatics services and applications	Based on the purpose of using collaboration services and applications, six major types of these applications were identified: <ol style="list-style-type: none"> 1) Information aid 2) Decision aid 3) Education aids 4) Management aids 5) Health sales services 6) Meta/rating services

services/applications provided by the health-related websites (e.g., [26]). Second, the existing typologies in this context do not distinguish Health 2.0 websites (e.g., DailyStrength.org) from general-purpose virtual communities (e.g., Facebook and Twitter). Consequently, these typologies do not cover numerous state-of-the-art collaboration platforms such as physician-rating and ask-a-doctor, which are provided specifically by Health 2.0 websites. Next, the Health 2.0 typologies proposed by the extant literature are not built on Health 2.0 users and the collaborations between them. We believe that taking the Health 2.0 users into account while developing typologies in this context is essential because the nature and structure of the Health 2.0 collaboration platforms and websites depend on the users of these websites and their specific needs and goals when using such websites to communicate. Therefore, in this paper, we develop a Health 2.0-specific typology that revolves around two major types of Health 2.0 users and the interactions between them. In the following section, we describe the method we employ to develop our typology.

3 Method

In order to develop our typology, we followed a two-step method used in various typology development studies. This method, also known as conceptual-empirical approach [27], revolves around a logically-supported conceptual development of a typology followed by an empirical verification. Accordingly, in the first step of our typology development, we proposed a typology of collaboration platforms and websites within the Health 2.0 context. The conceptual development is built on the prior literature on social media platforms [24, 25] as well as e-commerce business models [28, 29]. It is followed by an empirical verification of the proposed typology. To do so, we searched various keywords relevant to our study such as “virtual health communities”, “online patient communities”, “online physician communities”, “health blogs”, and “health social media” on Google.com to find relatively popular English language Health 2.0 websites so we can compare them with respect to our typology. The search output helped us in two ways. First, some Health 2.0 websites are among the first Google hits and could be included in our list of Health 2.0 websites. Second, various websites that rank health social media and websites are provided as the search result. We used this ranking of websites to identify the top-ranked Health 2.0 websites in terms of the number of users and page views. We compared the lists provided by these ranking websites and included the ones in our list that are consistently mentioned as top Health 2.0 websites used by either patients and caregivers or physicians and medical doctors. It is worth mentioning that our goal was not to find Health 2.0 websites

with the highest frequency of visitors. Therefore, the way that we prepared our list is appropriate for our study. Our final list includes 20 Health 2.0 websites. We visited each of the websites and studied their missions, types of users, and the collaboration platforms they provide for their users. In this vein, we validated our typology.

4 The proposed typology

In this section, we develop a typology of Health 2.0 collaboration platforms. Then, we focus on Health 2.0 websites, develop a typology for the websites, and discuss how various types of collaboration platforms proposed and discussed in the first part of this section can be utilized within each type of Health 2.0 website.

4.1 Typology of health 2.0 collaboration platforms

Within the context of Health 2.0, we define collaboration platform as *socially-enabled computer-mediated communication environment used for contribution of health-related digital content (e.g., articles, messages, emoticons, videos)*. As opposed to the traditional computer-mediated communication tools and technologies such as e-mail, private messaging, and chat services, Health 2.0 collaboration platforms are more comprehensive systems built upon collaborations on health-related topics, making social ties among individuals, and creating social support exchange relationships among them. Health 2.0 collaboration platforms derive their structures, applications, technologies, and characteristics from a wider concept of “Web 2.0 collaboration platforms” - sometimes called Web 2.0 applications, functionalities, or tools - such as blogs, online social networks, and user reviews [25, 30]. Among different taxonomies proposed for Web 2.0 collaboration platforms that can be applied to the context of health-care, we consider the one provided by Scanfeld, et al. [24] a starting point for our typology (Table 2).

In the classification proposed by Scanfeld et al. [24], they distinguish among seven major collaboration platforms widely provided by socially-enabled websites. These platforms could be used for sharing health information among users of these websites. In our study, we revised the Scanfeld et al.’s [24] classification because they do not focus on the health 2.0 websites which are dedicated to health topics (e.g., DailyStrength.com). Rather, they also consider general-purpose online social networks such as Facebook and Twitter. Thus, the set of social media platforms proposed by them does not cover health-specific platforms such as health forums or ask-a-doctor which are widely provided by health 2.0 websites. Moreover, the platforms such as “microblog” and “social news and bookmarking”, included in Scanfeld et al.’s [24] classification,

Table 2 Social Media Platforms Adapted from [24]

Collaboration Platform	Description
Blog (“Weblog”)	A website that contains regularly updated entries displayed in reverse chronological order.
Microblog	A form of blogging that allows users to send brief text updates or micro-media to be viewed by the public or a restricted group.
Social Networking Website	Online communities that share interests and/or activities.
Wiki	A website that enables the easy creation and editing of interlinking web pages.
Social News and Bookmarking	Social bookmarking enables users to save and share links to web pages organized by metadata (e.g., “tags,” or keywords). Social news sites often enable users to vote on links to news, bringing the most popular stories to the top.
User Reviews	A website or site feature on which people can post opinions about people, businesses, products, or services.
Photo/Video Sharing	A website that enables the publishing of a users’ digital photos or video clips online, facilitating sharing with others.

are not typically utilized by health 2.0 websites. Therefore, we customized their classification to make it better fit in the Health 2.0 context. We also customized the definition of each type to make them meaningful in the context of our typology. Thus, the Health 2.0 collaboration platforms we focused on in this study along with their definitions are summarized in Table 3.

Collaboration platforms listed in Table 3 can be incorporated into various forms of Health 2.0 websites and used by different types of Health 2.0 users. In general, there are two major types of users/actors within the context of Health 2.0, namely, 1) health consumers such as patients and caregivers, and 2) health professionals such as medical practitioners and dentists. Both health consumers (C) and health professionals (P) can serve as either support provider or support recipient while interacting with other Health 2.0 users. Accordingly, the collaborations within Health 2.0 websites can be categorized into four major types: professional-to-professional (P2P), professional-to-consumer (P2C), consumer-to-consumer (C2C), and consumer-to-professional (C2P). P2C collaborations occur when health professionals provide support for health consumers; while, C2P collaborations can be realized when health consumers contribute their experience and opinions to health professionals. P2P and C2C collaborations represent interactions and support exchanges among health professionals and health consumers, respectively, on Health 2.0 websites.

This perspective toward collaborations among Health 2.0 users is very similar to the way e-commerce transactions³ are categorized by researchers and practitioners in different fields into consumer-to-consumer (C2C), consumer-to-business (C2B), business-to-business (B2B), and business-to-consumer (B2C) [28, 29]. For example, in the context of e-commerce, when a product or service is provided by companies for

individuals over the Internet, B2C transactions occur (e.g., purchasing a laptop from Dell.com). Whereas, when individuals sell and buy items from other individuals, C2C transactions are realized (e.g., trading on Ebay.com or Craigslist.com).

Given the four types of collaborations among Health 2.0 users, the platforms proposed in Table 3 can enable and support specific type(s) of collaborations within the Health 2.0 context from P2P to C2C. For instance, online social networks can be used for both C2C and P2P communications; whereas, ask-a-doctor platform is primarily used for P2C support provisions. Thus, in the following section we further develop our typology of Health 2.0 collaboration platforms and discuss how each type of platform supports specific types of collaborations among Health 2.0 users.

4.1.1 Platforms supporting P2C collaborations

P2C collaborations occur when health professionals provide supports for health consumers through Health 2.0 environments. Two major platforms used by health professionals to provide direct support for the patients are health blogs and ask-a-doctor. Health blogs have become an important source of online health information for Internet users [31]. They are typically authored by health professionals and comprise health-related news, information, and tips that can be beneficial for health consumers [32]. The Internet users who read the blogs can then post their comments and questions regarding the topics of those blogs. Other blog readers as well as the blog authors can afterwards answer the questions posted to the blogs.

Ask-a-doctor is the second prominent P2C collaboration platform. Using this platform, any user can ask specific questions regarding medications, diseases or any health-related topics from the health professionals approved by the website. These health professionals then provide the user with an answer that is specifically tailored based on

³ A simplified definition of Electronic commerce or e-commerce is buying and selling over the Internet.

Table 3 Health 2.0 Collaboration Platforms

Collaboration Platform	Description
Health Blog	A collaboration platform that displays postings by one or more individuals on different health-related topics such that other Internet users can post their comments on each entry. [24]
Physician-Rating	A collaboration platform through which people can post their opinions about health professionals such as doctors and dentists. [24]
Medicine-Rating	A collaboration platform through which people can share knowledge and experience about different types of medicine.
Online Health Social Network	A collaboration platform on which users can create a public or semi-public profile, share their personal information such as demographics, photos, health conditions, and feelings, and make connections with other users of the website by adding them to their friends lists. [34]
Health Discussion Board/Forum	A collaboration platform for the open discussion of subjects relevant to health and wellness. [46]
Ask-A-Doctor	A collaboration platform through which health consumers can ask their questions and receive responses from health professionals hosted on a given Health 2.0 website.

the user's question. Unlike the P2C interactions through health blogs, the interactions based on ask-a-doctor is initiated by a health consumer. Ask-a-doctor platform can be provided as a private channel such that the answers by the health professionals cannot be viewed by any user other than the one who asks the question (e.g., DailyStrength.org). Other Health 2.0 websites (e.g., MedHelp.com), provide a more socially-enabled ask-a-doctor platform such that when a user posts a question and the health professionals answer that, other users can also view the question-answer thread and engage in the discussion.

4.1.2 Platforms supporting C2C collaborations

Various collaboration platforms are provided by Health 2.0 websites to enable health consumers to interact, make social ties, and support each other on their health issues and concerns. The most widely used C2C collaboration platform is health discussion boards, or forums. Health discussion boards are topic-oriented platforms used by health consumers to discuss on specific diseases, treatments, or any other health-related topic [33]. Health consumers initiate discussion threads on a topic, ask a question, and/or seek support from others on the website. In response to the thread initiator, others post their comments to the thread and provide the thread initiator with their thoughts, sympathy, information, and experience that specifically address the thread topic. Forums are typically categorized based on different criteria such as medical conditions (e.g., cancer, depression) or treatments.

Online social networks of health consumers are another C2C platforms widely used by Health 2.0 websites. Using this platform, users create profile pages, add profile photo, share personal information such as demographics and health status, and make connections with each other by adding individuals to their friends lists [12]. This structure is very

similar to the typical structure of general online social networks such as Facebook and MySpace [34].

Although online health social networks and health discussion boards have much in common, they have their differences. Online social networks and the interactions based on them are basically user-oriented [34]. Consequently, social ties between users who interact based on these platforms are strong, emotional-based, and long-term; whereas, the interactions that occur within discussion boards are inherently topic-oriented [20, 34]. Thus, the social ties formed between users who engage in discussion threads are more transaction-based. It leads typically to short-term relationships between those who participate in discussion threads and support each other merely through these channels. The main advantage of discussion boards is that users can take advantage of others' knowledge and experience, regardless of their friendship status. This leads to an extensive knowledge base available to users, compared to situations where users seek information only from their friends within the community. Additionally, discussion boards provide a more structured platform that users can initiate, follow, or contribute to the topics of more interest to them.

Health blogs can also be used for C2C communications. Health consumers initiate blogs on their current health issues, concerns, or questions and others post their supportive messages to the blog. The difference between personal health blogs and discussion threads is that health discussion threads are categorized based on specific health topics; while, blogs can be on any topic of interest to the user. Thus, health blogs are usually incorporated into online social networks such that users can simply initiate their personal blogs on their profile pages (e.g., DailyStrength.org).

User reviews which is another collaboration platform used for C2C interactions primarily emerge in two forms: medicine-rating and physician-rating. Medicine-rating

platforms provided by Health 2.0 websites enable health consumers to share their experience and knowledge on the effectiveness, side effects, and other characteristics of medicines. User can also rate drugs and compare the drug ratings. (e.g., AskAPatient.com). Physician-rating platforms are also among the fastest growing user reviews in the context of Health 2.0 [35, 36]. Using this form of C2C platform, health consumers post their reviews on doctors, surgeons, health practitioners, and any other health professional. Moreover, physician-rating platforms sometimes allow the users to rate clinics and hospitals in terms of the quality of healthcare services they provide for their patients. The reviews posted are useful for the patients who may potentially need to visit any specific healthcare organization or health professional.

4.1.3 Platforms supporting P2P collaborations

Health professionals can also use Health 2.0 collaboration platforms to communicate with their colleagues. Discussion boards, for example, can be used by them to discuss on specific diseases, treatments, medications, surgery techniques, technologies, and other professional topics in their areas of expertise. This can enable health professionals to always be up-to-date on health-related sciences and technologies.

Online social networks can also be used by health professionals to make social ties with other health professionals. They can post their personal information such as expertise, education, research interests, workplace, and contact information on their profile pages. This helps them expand their professional social network beyond the geographic area and/or the healthcare organization in which they work. They can also integrate their offline social network with online social networks, so that they always keep in touch with other health professionals whom they would visit and contact less frequently without using online social networks.

Health blogs can also be initiated by health professionals and contain expert contents targeted for other health professionals in the same or a similar area of the blog writer's expertise. Health blogs can be used as an alternative to discussion boards for P2P collaborations. Similar to C2C health blogs, P2P health blogs can also be integrated with the users' profiles on their online social networks so that these blogs become more personal compared to health discussion threads. Therefore, using health blogs, health professionals can not only discuss about professional topics, but also about their daily experiences and stresses in their work or personal lives.

4.1.4 Platforms supporting C2P collaborations

Unlike the previous types of collaborations, C2P collaborations are not well-supported by the current types of Health 2.0 collaboration platforms. However, physician-rating websites

can be used by health consumers to post their reviews on health professionals for the use of these professionals and not merely for the advantage of health consumers. For example, healthcare organizations can provide specific physician-rating platforms for their patients so that the organization management team can learn about the patients' opinions about the physicians who work in the organization. This can help them improve the quality of care they provide for their patients. A summary of the types of collaboration platforms that enable and support each type of collaboration within Health 2.0 websites is presented in Fig. 1.

4.2 Typology of Health 2.0 websites

Health 2.0 websites are different with respect to the type of users and the collaboration platforms they provide for their users. For example, some websites revolve around health consumers and enable their interactions with other health consumers (e.g., PatientsLikeMe.com); whereas, others focus on providing useful health and wellness information for their users by their health professionals (e.g., KevinMD.com). Thus, consistent with the typology we utilized to classify Health 2.0 collaborations, and collaboration platforms, we also use four major categories including P2C, C2C, C2P, and P2P to categorize Health 2.0 websites.

4.2.1 P2C Health 2.0 websites

P2C websites primarily use P2C collaboration platforms (health blogs and ask-a-doctor) to communicate with their users, namely, health consumers. These websites typically do not aim to help health consumers find others with similar health concerns and issues. Rather, they support health consumers with recent health news, findings, tips, and advices. Although ask-a-doctor platform can be used within these websites, currently, most P2C websites are stand-alone health blogs (e.g., KevinMD.com). Therefore, we simply use the same term for this quadrant of the typology framework.

4.2.2 C2C Health 2.0 websites

Consumer-to-Consumer (C2C) is the second and probably the most widely used category of Health 2.0 websites. C2C websites revolve around health consumers and provide various collaboration platforms for them to communicate with other members of the website and exchange health-related information and experience as well as emotional support in communications with them. We refer to C2C websites as "virtual communities of health consumers" (VCHC). Using this term in this context is consistent with the general definition of a virtual community provided by Chiu, Hsu, and Wang [37] as "online social networks in which people with common

		Support Recipient	
		Health Professional	Health Consumer
Support Provider	Health Professional	<p>P2P</p> <ol style="list-style-type: none"> 1. Online Social Networks 2. Health Discussion Boards 3. Health Blogs 	<p>P2C</p> <ol style="list-style-type: none"> 1. Health Blogs 2. Ask-A-Doctor
	Health Consumer	<p>C2P</p> <ol style="list-style-type: none"> 1. Physician-Ratings 	<p>C2C</p> <ol style="list-style-type: none"> 1. Online Social Networks 2. Health Discussion Boards 3. Health Blogs 4. Medicine-Ratings 5. Physician-Ratings

Fig. 1 The Proposed Typology of Health 2.0 Collaboration Platforms

interests, goals, or practices interact to share information and knowledge, and engage in social interactions” (P. 2). These types of websites are sometimes referred to as patient communities [38]. WebMD.com and DailyStrength.org are two prominent examples of VCHCs. Health 2.0 websites rely heavily on two forms of C2C collaboration platforms: online social networks and health discussion boards/forums. Most popular VCHCs provide both of these platforms for C2C collaborations. For example, users of DailyStrength.org can join the website, create their profile pages, find others with similar health concerns, add them to their friends’ lists and create a long-term support and exchange relationship with them. They can also join support groups on specific diseases (e.g., Cancer, Depression, ADD/ADHD) and engage in the discussion threads initiated within each support group.

In addition to online social networks and health discussion boards, VCHCs usually incorporate other types of collaboration platforms, particularly P2C platforms including health blogs, and ask-a-doctor. Users can take advantage of the knowledge provided by health professionals who are approved by the website. These platforms can also contribute to the websites’ revenue model. For example, some Health 2.0 websites provide ask-a-doctor services for their users and charge them each time a user asks a question (e.g., DailyStrength.org). Other websites, however, do not charge their users for using this platform (e.g., HealthBoards.com).

4.2.3 P2P Health 2.0 websites

The third category of Health 2.0 websites in our typology is P2P websites. Unlike the two previous types of

Health 2.0 websites, the main users of P2P websites are health professionals. The main mission of these websites is to facilitate interactions among health professionals so that they can exchange opinions, knowledge and experience on diseases, treatments, medical cases, and other topics that can help them enhance their professional knowledge [39]. From a structural point of view, P2P Health 2.0 websites have much in common with VCHCs in that both can offer social networks, discussion boards, and blogs for their users. Thus, we refer to these websites as “virtual communities of health professionals” (VCHP).

As previously mentioned, by using online social networks offered by VCHPs, health professionals can make social ties with their colleagues. They can also use discussion boards to engage in topic-oriented discussion threads and share their professional knowledge with other users of the website. Also, health professionals can initiate professional health blogs to convey knowledge on state-of-the-art research findings, medical cases, products, tools, and techniques. Sermo.com, with more than 120,000 members is one of the most frequently visited VCHPs. Doximity.com and Ozmosis.org are also widely adopted VCHPs in the United States.

4.2.4 C2P Health 2.0 websites

The fourth category of Health 2.0 websites is referred to as C2P. These types of Health 2.0 websites are intended to be channels through which health consumers can provide useful health-related information for health professionals

through collaboration platforms. Unlike the previous three types of Health 2.0 websites, C2P websites are not yet evolved and widely used. A major category of Health 2.0 websites that can be regarded as C2P is physician-rating websites. Physician-ratings are proposed as distinctive collaboration platforms that can be incorporated into non-C2P websites as well as C2P websites (Table 3). However, given their specific mission, they are recently established as stand-alone websites [36]. These websites invite health consumers to share their experience not only for the use of other health consumers, but also for the health professionals and organizations to know more about patients' concerns and opinions. Doctors can improve their support and services, accordingly. Two popular physician rating websites are HealthGrades.com and iWantGreatCare.org.

Over the last few years, several physician-rating websites have been created; however, new types of C2P collaboration platforms and websites can potentially be developed and used by health professionals. Accordingly, they can take a full advantage of learning from patients' experiences in order to enhance their professional knowledge and provide better medical services for their patients. A summary of the types of Health 2.0 websites is provided in Fig. 2.

5 Typology in action

In order to validate the proposed typology and make it clearer we apply our typology to a list of 20 Health 2.0 websites. Considering the different types of platforms and websites introduced in the typology, we compare these websites and the prominent platforms they provide. As mentioned earlier in the Method section, to compile the list of 20 Health 2.0 websites, we searched various keywords relevant to health social media on Google.com to find relatively popular health-related websites that provide collaboration platforms for their users. We compared the search results with the list of the top health-related websites provided by different blogs,⁴ ranking services,⁵ and other websites.⁶ Then, we included the names of the Health 2.0 websites that appear in different rankings and that offer socially-enabled services and features. The results containing the names and types of the websites found throughout this search process as well as the types of collaboration

platforms provided by these Health 2.0 websites are summarized in Table 4 as follows.

The list of the 20 Health 2.0 websites that are presented in Table 4 consists of 11 VCHCs, six VCHPs, one health blog, and two physician-rating websites. Accordingly, VCHCs typically rely upon C2C platforms, more specifically health social networks and discussion boards. This list also shows that five of the VCHCs provide at least one P2C platform (ask-a-doctor and/or health blogs); while, the other VCHCs solely provide C2C platforms and do not engage health professionals in the services they offer to health consumers. Unlikely, VCHPs merely incorporate P2P platforms and do not provide any channel through which health professionals can interact with health consumers through these communities. Moreover, consistent with their definitions, health blogs and physician rating websites in our list are uni-platform and the user interactions through them revolve around the only collaboration platform they provide.

In the next section we provide a discussion on the typology proposed in this article.

6 Discussion and conclusion

In this study, we developed a typology of Health 2.0 collaboration platforms as well as a typology of Health 2.0 websites. Our typology of collaboration platforms was initially built on a categorization of social media tools and platforms proposed by Scanfeld et al. [24]. We customized that classification to make it fit in the context of Health 2.0, which is to our interest in this study. Thus, we focused on the six major collaboration platforms widely used in this context. We also categorized Health 2.0 users into health professionals and health consumers. Then, we discussed how each type of collaboration platform can be utilized for interactions within and between health professionals and health consumers. Next, we proposed a typology of websites based on their target users and the type of support these websites provide. In result, we distinguished among virtual communities of health consumers as C2C websites, virtual communities of health professionals as P2P websites, health blogs as the major P2C websites, and physician-ratings as the prominent C2P websites. Finally, we applied our typology to a list of Health 2.0 websites and compared and contrasted the collaboration platforms they provide for their users.

The typologies developed in this study can be cultivated in various areas of research and practice including health communications, health informatics, computer-mediated-communications, and information systems. Moreover, future studies can address specific research questions within

⁴ For instance, <http://blog.marketnet.com/index.php/2009/11/09/16-niche-healthcare-social-networks/> and <http://healthcareers.about.com/od/advanceyourcareer/tp/MedicalSocialNetworkingCommunitiesOnline.htm>

⁵ For instance, <http://www.alexa.com>

⁶ For instance, <http://www.ebizmba.com/articles/health-websites>

		Support Recipient	
		Health Professional	Health Consumer
Support Provider	Health Professional	<p>P2P Virtual Communities of Health Professionals (VCHP) E.g., http://www.Sermo.com http://www.Ozmosis.org</p>	<p>P2C Health Blogs E.g., http://www.KevinMD.com</p>
	Health Consumer	<p>C2P Physician-Rating Websites E.g., http://www.HealthGrades.com http://www.iWantGreatCare.com</p>	<p>C2C Virtual Communities of Health Consumers (VCHC) E.g., http://www.WebMD.com http://www.DailyStrength.org</p>

Fig. 2 The Proposed Typology of Health 2.0 Websites

the scope of the types of websites in our typology. For instance, in the future, researchers can define subcategories of Health 2.0 actors (e.g., healthcare professionals in primary care vs. specialists) to refine or expand our typology. In the following section, we provide our suggestions on six major research areas that future studies can focus on .

6.1 Future research

6.1.1 Synchronous collaboration platforms

Currently, Health 2.0 websites tend to provide asynchronous collaboration platforms; while, synchronous platforms such as chat rooms, video conferencing environments, and webinars can be incorporated into different types of Health 2.0 websites for the users’ real time communications. Chat rooms, for example, can be used as an alternative or as a complement to health discussion boards. If chat rooms are developed within VCHCs, users can join them and discuss on specific medical topics including their current health issues, concerns, and experience in a real-time manner. VCHCs can also enable the users to chat with health professionals and ask their questions through this medium. Moreover, in VCHPs, professionals can take advantage of chat rooms to discuss on medical cases in their areas of expertise in real time. In order to enrich the interactions via chat rooms, video communication functionalities can also be added to them.

Video conferencing and webinars (web-based presentations, lectures, or workshops) can also be used for

educational purposes targeting health professionals or health consumers. VCHC can offer periodic webinars each on specific health/wellness topic for their users. Webinars could be even more effective than traditional health blogs for conveying health tips and advices from health professionals to health consumers. Additionally, medical webinars can be held within VCHPs for health professionals so they can enhance their knowledge on the areas of their expertise.

In future studies, the potential values that each of the aforementioned synchronous collaboration platforms can provide for Health 2.0 users can be investigated. Researchers can also study how these platforms can be combined with their asynchronous counterparts to make health consumers and professionals more inclined toward adopting and using Health 2.0 websites and participating actively within these environments.

6.1.2 Mobile applications

Another type of collaboration platform that is not yet widely offered by Health 2.0 providers and consequently, not researched adequately in the context of Health 2.0 is mobile applications. Recently, various communities including Sermo.com and WebMD.com have offered mobile applications for their users such that the members of these websites can communicate using their mobile devices. Other communities such as Epocrates.com have gone beyond that and based their business model solely on developing and providing mobile applications, mostly for

Table 4 Health 2.0 Websites and Collaboration Platforms

Website Name	Type of Health 2.0 Website ¹	Type of Health 2.0 Platform					
		P2P	P2C		C2C		C2P
		Professional Discussion Board	Health Blogs	Ask-A-Doctor	Online Social Network	Discussion Board	Physician - Rating
DailyStrength.org	VCHC	-	√	√	√	√	-
WebMD.com	VCHC	-	√	-	-	√	-
Connect.MayoClinic.org	VCHC	-	-	-	√	√	-
Drugs.com	VCHC	-	-	-	√	√	-
AskaPatient.com	VCHC	-	-	-	-	√	-
HealthBoards.com	VCHC	-	-	√	√	√	-
PatientsLikeMe.com	VCHC	-	-	-	√	√	-
MedHelp.com	VCHC	-	√	√	√	√	-
Inspire.com	VCHC	-	-	-	√	√	-
CancerForums.net	VCHC	-	-	-	√	√	-
Breastcancer.org	VCHC	-	√	√	√	√	-
Sermo.com	VCHP	√	-	-	-	-	-
Doximity.com	VCHP	√	-	-	-	-	-
MedScape.com	VCHP	√	-	-	-	-	-
Ozmosis.org	VCHP	√	-	-	-	-	-
PeerCase.com	VCHP	√	-	-	-	-	-
Orthomind.com	VCHP	√	-	-	-	-	-
KevinMD.com	Health Blog	-	√	-	-	-	-
HealthGrades.com	Physician-Rating	-	-	-	-	-	√
iWantGreatCare.org	Physician-Rating	-	-	-	-	-	√

¹ The values in this column are based on the typology of Health 2.0 websites proposed in Fig. 2. Accordingly, VCHP and VCHC represent virtual communities of health professionals and virtual communities of health consumers, respectively

health professionals. However, there is still a huge potential for other Health 2.0 websites to take advantage of the mobile-based emerging technologies and collaboration platforms. In future studies, researchers can investigate the attitudes and perceptions of Health 2.0 users toward using mobile devices for different types of health communications from P2P to C2C. The potential capabilities of these platforms for enriching Health 2.0 communications can also be researched in future.

6.1.3 Knowledge discovery

Everyday millions of health-related posts are sent through various Health 2.0 websites. Each post may contain valuable information not only for the specific audience of that post, but for other health consumers and professionals. Health forums, for example, are becoming a rich repository of unstructured knowledge about health topics such as disease symptoms, medicine side-effects, successful treatments, medical cases, and medications. The knowledge stored in this way can be discovered and organized to be used by future patients, caregivers, and more importantly, by health professionals. Despite these opportunities, the application of knowledge management has still been overlooked by

healthcare information systems researchers and practitioners. Future research can examine how knowledge management techniques and strategies can be utilized in Health 2.0 collaboration platforms and websites and how the knowledge discovered in this way can create value for health professionals and health consumers.

6.1.4 Information privacy

Personal health information is sensitive information that individuals may not be willing to share and discuss through public collaboration platforms and websites [40, 41]. Thus, adopting Health 2.0 websites and active participation within them presents information privacy risks. While interacting with other Internet users, individuals may be concerned that the personal health information they reveal on a website may be misused by the websites administrator, the members of the website, or third parties such as insurance companies. Considering these privacy risks, health professionals may not be willing or allowed to discuss their patients on publicly accessible Health 2.0 websites. Nonetheless, Health 2.0 websites typically provide privacy policies and controls for their users.

The importance of health information privacy within the context of Health 2.0 demonstrates that researchers should focus more attention on this issue. Future research can assess perceived privacy risks and concerns of health consumers and professionals and provide practical guidelines for Health 2.0 providers to address user concerns more effectively. Website providers should also improve their privacy policies and utilize privacy enhancing technologies to better protect their members' privacy, which will result in members being more willing to participate actively in the collaborative activities on the website.

6.1.5 Information quality/credibility

A major challenge that the users of Health 2.0 websites face is the quality, reliability, and credibility of the information provided by others on the website. For example, users may share their experience of using specific medicine on discussion boards. However, how can one trust this information that comes from a user whose real identity is probably not disclosed on the website? To what extent do people rely on this information and take advice from other users on these websites? And, if a user claims to be a medical expert, how could his/her credibility be verified? Is it the website's responsibility to approve the reliability of the health information, tips, and advice shared through collaboration platforms, or should the users be aware of the potential risks of using and relying on such information? These are all questions that can be addressed by Health 2.0 website providers and by researchers in future studies.

6.1.6 Lurking

The success, growth, and viability of Health 2.0 websites is subject to the level of user participation. The online communities within Health 2.0 websites may not survive if the vast majority of the community is comprised of lurkers who merely read the posts and do not actively participate in the discussions and communications [42–44]. The extant literature has addressed the reasons behind active participation and lurking within different types of online communities. However, the specific characteristics of Health 2.0 collaboration platforms and websites as well as the specific reasons for joining and participating within these websites demonstrate that researchers should particularly study the drivers and inhibitors to knowledge contribution within Health 2.0 websites [45]. The results of these studies can also help website providers to foster user participation within their websites.

6.2 Limitations

The typology developed in this paper has limitations. First, because Health 2.0 is an emerging area and growing very

fast, new collaboration platforms may come into existence that are not included in our typology. Second, the sample of websites we used for empirical validation of our typology may not be representative of all the Health 2.0 websites that currently exist. Therefore, in future studies, a larger sample of websites can be analyzed in more detail in order to draw further conclusions regarding the collaboration platforms those websites provide.

Conflict of interest The authors declare that they have no conflict of interest.

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