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Social media enabled interactions in healthcare: Towards a taxonomy

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ABSTRACT

Healthcare users and providers increasingly utilize social media to interact with one another. For a future understanding of when and how these interactions supplement or replace offline doctor-patient interactions, it is essential to understand who interacts, about what, and how these interactions can be categorized in a taxonomy. We draw on affordance theory and employ a mixed-methods approach to study social media interactions among healthcare users and providers. We first engage in qualitative content analysis, which is followed by cluster analysis. We identify five archetypal interactions and categorize these in a taxonomy that adds to current literature on how social media is utilized in the healthcare context. We also provide a clear and systematic overview of the interactions in different social media categories that can stimulate future research regarding doctor-patient interactions. Furthermore, we identify a new and distinct type of social media enabled interaction in healthcare, namely lifestyle support, focusing on prevention.

1. Introduction

People increasingly rely on the Internet to search for health-related information. Recent statistics show that 52% of Internet users in the European Union have searched for health-related information (Eurostat, 2018). This rise in looking for health information online is particularly driven by social media, allowing users to exchange health advice with other users, change their behaviors, and communicate with their providers (Liu, 2021; Marent and Henwood, 2021).

In line with this, there has been increasing attention to this topic in social sciences. Literature has focused on exploring the types of use by users and how this use affects doctor-patient interactions (Marent and Henwood, 2021; Rueger et al., 2021; Stevenson et al., 2021). Overall, extant research has mainly explored social networking sites and identified main types of social media use for health purposes such as informational support (Rueger et al., 2021), emotional support (Rupert et al., 2014; Wang et al., 2015), network support (Pagoto et al., 2014) and companionship activities (Huang et al., 2019). This use of online sources has led to engaged patients affecting their interactions with doctors (Timmermans, 2020). In particular, the use of social media for different purposes, such as for informational support and emotional support, may improve but also worsen patients' relationships with their doctors (Benetoli et al., 2018). Thus, there is a need for a richer view on the types of interactions and platforms to understand better how and when different interactions could complement, supplement, undermine, or

replace face-to-face doctor-patient interactions. In this paper, by interaction, we mean an interplay and exchange afforded by social media in which individuals can influence each other.

Our study complements earlier literature on social media in healthcare by studying *who* interacts with *whom*, *about what*, and *which types* of interactions take place within the different categories of social media, as well as respond to recent calls in social sciences to explore how users engage with social media platforms (Gruebner et al., 2017). This is essential because the new technologies may provide different affordances that can shape doctor-patient interactions (Marent and Henwood, 2021). We categorize the interactions and propose a taxonomy of health-related social media use. To do so, we adopt a mixed-methods approach, integrating qualitative and quantitative methods to analyze a purposive sample of interactions from contrasting 20 social media platforms. We draw on affordance theory (Gibson, 1979; Treem and Leonardi, 2013). They attract and motivate users' participation on social media and provide opportunities to understand better online interactions (Majchrzak et al., 2013).

We have identified five archetypal interactions reflecting the focus on personal health condition resolution, knowledge-building through teaching, informing about healthcare products, empathizing with fellow sufferers, and lifestyle support. Furthermore, we argue that the dimensions of control (informal vs. formal) and generativity (low vs. high) provide a better understanding of the interactions and place them accordingly in the taxonomy using these two dimensions. On the one

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hand, we find that lifestyle support, informing about healthcare products, and empathizing with fellow sufferers are associated with informal control, while the interactions focusing on personal health condition resolving and knowledge building through teaching reflect the formal control. On the other hand, lifestyle support and personal health condition resolving reflect high generativity, while three other interactions reflect low generativity.

We conclude our study by discussing contributions to the extant literature in the social sciences by deepening the concept of informational support and showing that it can be categorized into three subtypes. Furthermore, we identify a new and distinct type of social media in healthcare, namely lifestyle support, focusing on prevention. Drawing on the affordances of control and generativity as essential concepts for the doctor-patient relationship, we provide a systematic overview of social media-enabled interactions. This allows us to explore further the challenges and the benefits that different types of interactions may bring to the relationships between doctors and patients. The taxonomy can help both patients and doctors better understand the type of interactions they engage in and how they can benefit their relationships.

2. Existing research

Patients often seek information from the Internet to find out more about their condition (Stevenson et al., 2021). This has further risen as social media has transformed communication from one-to-one to many-to-many enabling patients to easily reach for information and engage in receiving, sharing, and evaluating the advice from their peers. Recently, Rueger et al. (2021) utilized the network theory approach to demonstrate this phenomenon. They showed that patients value the speed and knowledge of their peers when receiving and evaluating advice. Although the patients ask and answer questions about how to best manage their disease, one of the main reasons patients use social media for health-related purposes is to satisfy emotional needs and hence supplement support they receive in interactions with their healthcare professionals (Rupert et al., 2014). This type of use includes sharing emotions with other patients and receiving support in handling emotional difficulties associated with health conditions (Antheunis et al., 2013). In that study, Antheunis et al. (2013) conducted a survey showing that patients use social media to increase their knowledge, stay up to date with their condition and express their emotions about their disease, especially on Facebook. Drawing on assemblage theory to explore online and offline therapeutic activity, a recent study also illustrates that patients find support for their emotional well-being using digital technologies such as social media forums (Trnka, 2021).

Moreover, through social media, patients may provide informational support to one another (Rueger et al., 2021). Drawing on theoretical concepts of co-production and tinkering, Campbell (2021) observed online communities focused on wellness and have shown how users of the community provided each other with concrete informational support using their lay expertise. This is also in line with an early study of Bartlett and Coulson (2011), who surveyed several social media forums to examine the use of social media and its effects. Their findings have shown that the informational support provided in the social media forums mirrored the type of support they used to receive from face-to-face groups. Another recent study by Stevenson et al. (2021) explicitly took a conversation analytics approach and showed that patients rely on online sources to help them manage their disease and communicate this in interactions with their doctors. This is somewhat in line with earlier findings showing that the patients supplement the information received from healthcare professionals in this way (Rupert et al., 2014). However, other types of use can be identified on social media platforms, such as network support (Pagoto et al., 2014) and companionship activities (Huang et al., 2019). For example, Huang et al. (2019) have drawn on the social capital perspective to build a model and empirically show that online relational capital facilitates the use of social media for companionship activities. Furthermore, Pagoto et al. (2014) studied Twitter

users and have shown that networking with others helped their weight loss. This is not surprising given that the existing research primarily focuses on social media platforms such as social networking sites (Pagoto et al., 2014).

However, the patients may use various social media categories to find resources to facilitate their health behaviors, such as content communities (Yiannakoulis et al., 2017). The participation and type of use depend on the features provided in the platform (Miller and Tucker, 2013). In line with this, a recent study by Marent and Henwood (2021), drawing on the example from HIV care, demonstrates that the affordances offered by digital platforms may play an essential role in understanding the interactions better. Furthermore, in an in-depth qualitative study of the use of video conferencing for psychiatric emergencies, Trondsen et al. (2018) found that video conferencing afforded immediate assessment and increased transparency in interactions between providers and patients. In the context of electronic prescription service technology, Petrakaki et al. (2014) theoretically proposed that technological affordances have a transformative capacity for the communication process. Somewhat in line with this, Abrishami et al. (2014) study has shown that the communication-related affordances that facilitated patient's choices also facilitated the adoption of robots in a healthcare context. The study of Merolli et al. (2014) focused on the affordances of social networking sites (SNS) for chronic disease patients proposing that the use of SNSs provided them with therapeutic affordances through enabling interactions focused on exploration of the content and connection with others. However, technological affordances provided by technological systems can also lead to challenges. In particular, Murdoch et al. (2015) analyzed recordings of interactions between nurses and patients to find out that decision support systems led to interactional dilemmas that the nurses experienced when communicating with the patients and recording this in the system.

Overall, the extant research lacks a complete understanding of the social media-enabled interactions in healthcare. First, the extant research has not explored the use of social media in a healthcare context across different categories of social media using the affordances lens. Specifically, the current approaches focus on a single category, thus preventing generalization across different categories. Second, extant studies that have employed the affordances lens have not focused on social media technologies in healthcare. Hence, building on the affordances lens enable us to explore how they can stimulate different types of interactions and thus possibly different effects on offline doctor-patient interactions.

3. Affordance lens

Adopting an affordance lens for social media study in healthcare provides an opportunity to theorize sociotechnical systems without being technologically or socially deterministic, thus better understanding the relationships between technology and social practices (Ellison et al., 2015; Treem and Leonardi, 2013). Developed by Gibson (1979) to explain how objects may be perceived differently by different species of animals, the affordance perspective assumes that objects are not perceived directly but for the activities for which they may be helpful. In terms of technology, affordance refers to the potential action that can be undertaken given a technology (Treem and Leonardi, 2013). However, we are interested in the sociotechnical dimensions of affordances (Robey et al., 2013), which are only partly determined by the technical features. The affordance lens enables us to consider the relationship between the action taken in a given context and the technology's capability (Zamuto et al., 2007). Affordances emerge from users' encounters with technology and represent what users can do concerning their goals. Therefore, affordances need to be understood in relation to the technical properties of technology together with the social dimension of its users (Hultin and Mahring, 2014).

Treem and Leonardi (2013) describe four affordances enabled in social media. They argued that social media communication is

characterized by visibility, persistence, editability, and association. Visibility refers to social media's potential to permit users' actions, emotions, and connections to be visible to others. In healthcare, patients can restrict or make visible their profile and content to others in social media support communities (Bender et al., 2011). Persistence denotes that, once published on social media, the content created is available to other users even after the poster has logged out of the social media application (Treem and Leonardi, 2013). In this sense, this represents an opportunity to permanently keep the record of social media-based interactions between patients and healthcare professionals instead of face-to-face interactions (Mao and Hovick, 2020). Editability reflects an opportunity to refine and edit the content even after others have viewed it. For example, both original authors and other users can easily edit and refine the health content in collaborative communities (Holtz et al., 2018). Final affordance is the option of association (or connection) between users and users and content. Rueger et al. (2021) have illustrated that those patients using social media health community can build connections with specific types of users, such as those who share similar health-related interests.

Whereas the four affordances proposed by Treem and Leonardi (2013) are useful and appropriate for the healthcare context and our analysis, we also enrich this framework by two additional affordances, namely generativity, and control. They are essential for understanding and categorizing interactions both from the social media use and potential changes in doctor-patient interactions. Accordingly, we categorize our interactions applying these two dimensions.

First, an essential concept for understanding interactions and potential changes brought about by social media is generativity. Generativity is a system's capacity to produce unanticipated change through unfiltered contributions from broad and varied audiences (Zittrain, 2008). The generativity affordance is particularly important because it refers to one's ability to produce new configurations and possibilities (Avital & Te'eni, 2009). Hence, generative capacity refers to a person's ability or a group to generate new ideas or new ways of communication. Generativity considers both the material properties of technology and the particular use context (Yoo et al., 2012). Generative capacity is thus a function of a system's inherent generative properties and the number and diversity of actors that can potentially engage with its artifacts. This is important as patients can take generative roles when engaging in conversations with individually defined roles. Concerning digital technologies, generativity allows information sharing to become inherently dynamic and flexible, enabling patients to engage with others and learn from their experiences (Rueger et al., 2021).

Another affordance that we include in building our taxonomy is control. This is an essential affordance for online interactions (Kuo et al., 2013) and doctor-patient relationships (Street et al., 2003). Control, as an affordance, allows actors to see the world in terms of what they can and cannot do and recognize that their actions may depend on what they perceive as possibilities for taking action (Fajen, 2007). Furthermore, it can be seen as a medium's affordance in providing individuals with the opportunity to regulate information flow during the interaction. In addition, social media affords control sharing when parties engage in interactions on social media. In this respect, control is vital for online health interactions and the traditional offline relationship between doctors and patients.

Overall, we apply the affordances approach of (Treem and Leonardi, 2013) along with the affordances of generativity and control as they are appropriate for the social media and healthcare context. In line with this, we analyze these affordances in relation to users' interactions with and via social media in the healthcare setting and propose the taxonomy as further elaborated in the methodology section.

4. Methodology

4.1. Research design

To fulfill the aim of this research to analyze and categorize social media-enabled interactions in healthcare, we adopted a mixed-methods approach in our data collection and analysis. We inductively develop the taxonomy by collecting and analyzing qualitative data, which then informs our quantitative data analysis. A key feature of social media is creating and exchanging user-generated content (Kaplan and Haenlein, 2010), for which qualitative content analysis is appropriate. To further validate and refine our inductive findings, we employ statistical cluster analysis.

4.2. Data collection

We selected six contrasting categories of social media taken from the taxonomy of social media categories proposed by Kaplan and Haenlein (2010) and searched for four instances of social media platforms for each category. In selecting the platforms and related content, we were guided with purposive selection to ensure variation and capture a range of perspectives relating to our research question. Here, we varied our case selection per category in two ways. First, we searched for general health versus condition-specific social media platforms. Second, we searched for user-initiated versus provider-initiated platforms as previous research has shown that the provider-initiated platforms include a disproportionate amount of provider-generated content and may not have to include much user-generated content (Miller and Tucker, 2013). We collected the data from 20 social media platforms, as shown in Appendix A. We observed and collected data from our cases by selecting posts and comments from blogs, social networking sites, content communities, and collaborative projects. Within each of these categories, we collected 400 posts and comments. Since we collected and analyzed publicly available and open data not revealing the identity of individuals, no Medical Ethical Committee approval was required under national law. Neither the relevant national act on medical research involving human subjects nor the University required ethical approval for the type of work conducted in this research.

4.3. Data analysis

To analyze the data, we followed three phases, which we elaborate on below and present in Appendix B. In the first phase, we selected and coded parts or entire posts and comments. In this way, we initially had 1727 quotes. We started the analysis with theoretical coding for the topic of interactions (Glaser and Strauss, 1967). For the nature of the communication, we were broadly guided by Interaction Process Analysis (IPA) to classify the communications based on their nature (Bales, 1950). We applied codes to each instance of communication to indicate the theme and the nature of the communication. In total, this analysis produced nine distinct thematic codes and six codes for the nature of the communication. We removed quotations that were classified as non-health, and this reduced our final sample to 1566 quotations. Following our coding process, we engaged in analytical induction. Specifically, knowing the data, we considered the relationships among emerging codes and quotes to identify the relationships and better understand the interactions. This was further analyzed in quantitative cluster analysis as elaborated upon below. Furthermore, the actualization of affordances was thematically coded as they appeared in the observed interactions. We sought to examine how the features of social media categories afforded interactions, specifically their editability (i.e., did users edit the content), visibility (i.e., did users adapt the visibility of their content and profiles), persistence (i.e., did users keep a record of their interactions) and association (i.e., if and how users connect with others and with content). For example, for the affordance of association, we were able to observe from the interactions and platform features if

the users liked the content as well as if and what comments they made about the content or about other users. The affordances of generativity and control were also analyzed on the basis of technical features and how the users utilized these features. For generativity, we observed if and how users employed the features of the platforms to generate new topics in an ongoing conversation. Finally, for control, we observed if and how the conversation was managed by users.

In the second phase of data analysis, we turned to quantitative cluster analysis to uncover archetypal interactions. We first re-coded our 1566 quotes based on the quote’s topic, the nature of the communication, the actor involved, and the platform characteristics. Besides these distinguishing characteristics for determining the clusters, we also recorded platform features to interpret the clusters. These features are the category of social media, the platform’s purpose, and the initiator of the platform. We applied hierarchical cluster analysis using Ward’s method with Euclidean distance, an approach that is widely used and recommended (Hair et al., 2010). As illustrated in Appendix C, we utilized the elbow effect to choose the optimal number of clusters, which has been earlier applied in social health sciences (Hobbs et al., 2019). Furthermore, an ANOVA test provided a meaningful interpretation of the results and allowed us to assess the clusters’ quality (Hair et al., 2010). Through this process, we arrived at five clusters representing archetypal interactions in health-related social media use.

In the third and final methodological step, we engaged in an iterative process to derive a taxonomy of health-related social media interactions. We based our choice of dimensions for the taxonomy on the control and generativity affordances and placed each archetype in the taxonomy as shown in Fig. 1.

5. Findings

As noted in the methods, we had 20 cases in total. Selected blog cases were from both providers and patients. They provided affordances of posting and commenting on the content in terms of both pictures and text. However, these cases did not afford personal messaging between the users. Social networking sites provided the same affordances as blogs, but the users were able to visit each other profiles and exchange personal messages. Content communities provided the users with the possibility to send private messages to those who posted the content only, but not other users who could communicate via comments only. Collaborative projects afforded the posting and editing of the content and discussions between users. However, virtual game worlds and virtual social world cases have not provided these affordances but rather communication with others using their avatars.

This section further presents the five archetypal interactions that came out of our cluster analysis, based on the topics and nature of

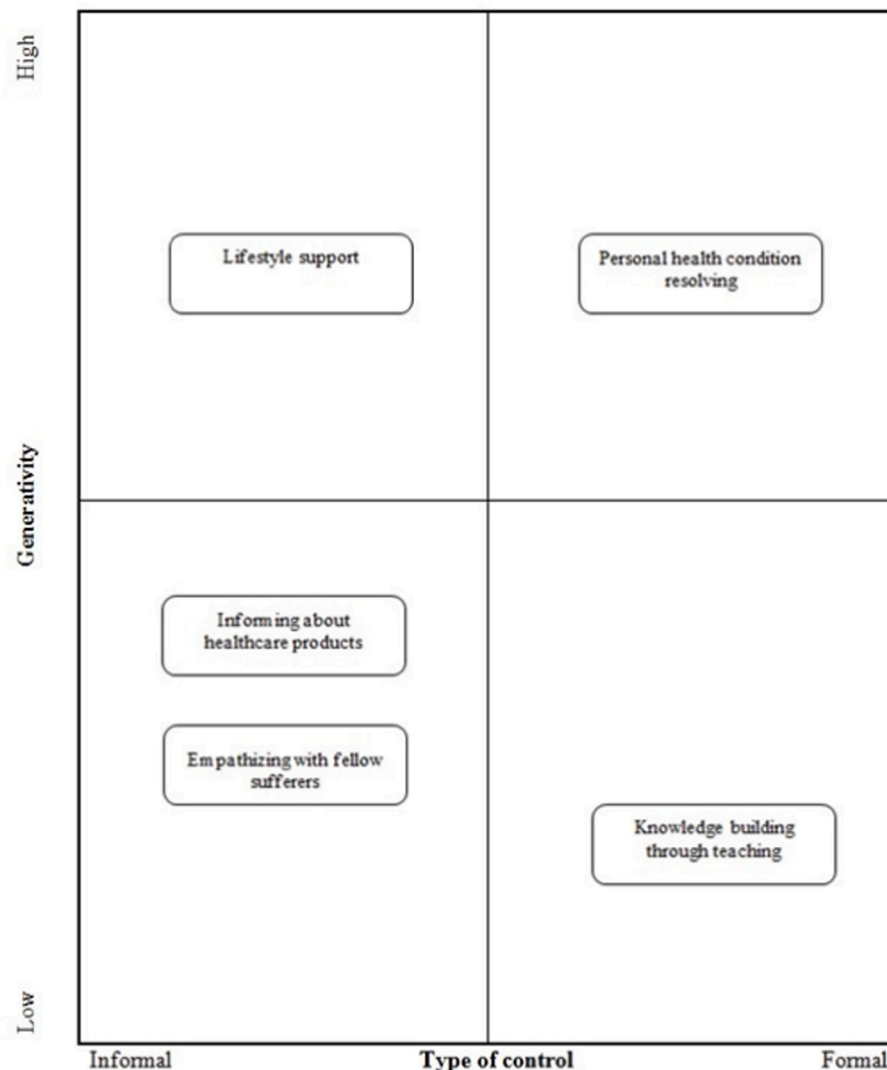


Fig. 1. Taxonomy of social media enabled interactions in healthcare.

communication we observed through qualitative content analysis. We describe and illustrate these archetypal interactions below and present a summary in Table 1.

We observed that interactions attempting to resolve a personal health condition mainly occur on social networking sites, providing easy editability and of posts and association with both users and content. Thus, technological affordances through high editability and association are combined with particular communication between actors. This archetype has a formal type of control as the question-and-answer format adheres to the doctor’s traditional role in charge, resembling offline doctor-patient interactions in which the doctor is the leading actor. For example, in the case of social networking site Medhelp, editability was afforded through the comments, which was actualized by users such as in the following example of interactions reflecting the formal control of a doctor:

Post (user): “... have coped, and asthma just had my check-up and quit smoking four years ago ... fVC pred.2.44 ... can’t understand Results am I doing ok please help”

Comment (provider): “You made a life-saving, lung-saving decision to quit smoking 4 years ago. One of the best health decisions you could ever have made. Don’t ever resume smoking. The results of this simple spirometry indicate ...”

The interactions quickly generate new discussions by, for example, switching from somebody’s personal experience to a general topic or even a discussion about a different condition. Hence, these interactions seem to provide a high level of generativity, which is also afforded by the social networking sites and content communities that provide an easy way to share information and comment on existing posts. This interaction is also high on generativity since the healthcare users could ask many questions and take time to explore various issues. This enables the emergence of new discussions and may extend patients’ knowledge on different aspects of their conditions. This archetypal interaction is initiated by healthcare users and directed toward other healthcare users and providers. The healthcare users describe their symptoms in detail and pose concrete questions to the providers. These interactions always focus on personal health conditions. A distinctive feature of these interactions is that the communication between the healthcare users themselves and the providers continues until the healthcare users are satisfied with an outcome. These interactions involve both expressing and asking, and they are carried out instrumentally.

A typical example of this archetypal interaction, taken from the Medhelp platform, is provided below:

Post (user): ... now I’ve been experiencing heart palpitations, weakness, fatigue, dizziness, and very rarely shortness of breath, loss of appetite I’m afraid Why do I have all these other symptoms?

Comment (provider): I might recommend checking your pulse whenever you have these spells to see whether you have a fast or irregular heart rate ...

Knowledge-building through teaching: In interactions characterized as knowledge-building through teaching, interactions are enabled through the affordance of high persistence. Blogs are a social media type that offers a long-term repository for specialized knowledge and actors’

constellation. The specific purpose of these platforms also provides a clear indication of what kinds of interactions are enabled. These platforms intend to increase specialized knowledge and transfer it to those patients who visit the platforms. For example, the case of Harvard Medical indicates that the objective is to share the knowledge of experts but allowing discussions through comments as indicated in the blog “Join the discussion with experts from Harvard Health Publishing and others like you on a variety of health topics, medical news, and views”. The interactions have a formal type of control as the topics are directed solely by the initiators (teachers), and the interactions are low on generativity as they do not encourage the emergence of interactions on new and different topics. The case of Harvard Medical illustrates this by providing blog posts about very concrete medical topics aimed at providing knowledge on different topics as illustrated with one of the quotes from the case “... a new report from Alzheimer’s Association says that as many as 5 million Americans have Alzheimer’s disease or some other form of dementia ...”. Although they are characterized by formal control, the interactions enable patients to gather highly specialized knowledge on the health topics posted. The content is addressed to healthcare users who react by showing appreciation and sometimes initiating a discussion with those providing the content (providers or users) as illustrated in the following quote “Thank you. Important information”. Besides, healthcare users give their opinions on the subject and discuss it among themselves and those who posted the content, for example, “While it’s true that there is currently a lack of effective treatment, it is not entirely accurate that there are no reliable screening tools”.

These interactions are primarily instrumental and concern general topics. They have a high proportion of healthcare providers in relation to other archetypal interactions. In these interactions, both the healthcare providers and the healthcare users who post act more as “teachers” by providing educational content. The goal seems to be building specialized knowledge on the topic in question, and those who post seem to have a high level of expertise regarding the topic. Often, the discussions refer to the role of different providers and policies regarding general health or treatments for particular conditions. The providers and users who consistently post instrumentally address healthcare users, attempting to address health topics in a general way rather than discussing personal experiences. The interactions reflect a high persistence affordance enabled by blogs as the general social media category for these interactions. Interactions reflect the formal hierarchy between those who act as “teachers” and users who follow and comment in their posts. This type of interaction does not offer high generativity as both the topic and the type of communication are usually determined by those who teach. A good example of this interaction is provided below:

Post (provider): ... That name is dermatographia urticaria, usually just called dermatographia or dermographism (literally “writing on the skin”). It’s a type of “trauma-induced urticaria,” but the trauma in this case can be ...

Comment (user): ... Very interesting article and it is kinda interesting that these allergy related textures can be created on skin with mild scratching ...

Informing about healthcare products: The third archetype, informing

Table 1
A summary of archetypal interactions.

Interaction type	Personal health condition resolution	Knowledge-building through teaching	Informing on healthcare products	Empathizing with fellow sufferers	Lifestyle support
Focus	Personal conditions and getting advice from providers	Building specialized knowledge through teaching users	Reviewing healthcare products	Providing emotional support	Guiding and promoting healthy lifestyles with focus on prevention
Actor Exchanges	Provider-to-user; user-to-user	Provider-to- user; user-to-user	User-to-user	User-to-user	Provider-to-user; User-to-user
Nature of interactions	Instrumental and personal	Instrumental and general	Mostly instrumental and general	Social-emotional and personal	Both social-emotional and instrumental, personal and general
Prevalent categories	Social networking sites, content communities, blogs	Blogs, collaborative projects	Blogs, collaborative projects	Content communities, Social networking sites	Social networking sites, content communities

about healthcare products, occurs mainly in blogs and collaborative projects. Collaborative projects do not offer many technological affordances in terms of associating with others. In particular, users do not comment on each other posts but somewhat further (re)edit the content. For example, although the collaborative community WikiDoc offers technological affordance of discussions through the section of “Discussions”, we observed many (r)edits of the content (through history page), but with no discussions between users, for example, “... *Overview: Attention-deficit hyperactivity disorder (ADHD) is a problem with inattentiveness, over-activity, impulsivity, or a combination.*” while the discussion most often was left empty indicating the following text “... *there is currently no text in this page ...*”. This indicates that the interactions in collaborative projects occur between a limited number of actors who do not associate with each other but rather with the content. The same may apply to blogs written by individuals, who then direct or limit interaction with the products in question. The interactions have an informal type of control and are low on generativity. For example, E-Dave blog’s post about developing new knee replacement generated only two comments, reflecting the informal type of control by being thankful and informal control as illustrated through the way the comment is written in the following quotes: “... *I like the valuable info ... I am moderately sure I will be told lots of new stuff right here!*”. Having a low scope of control and low generativity, coupled with a limited number of users, means that the healthcare users receive explicit knowledge on a particular aspect of their health condition.

This archetypal interaction mainly takes place among healthcare users. The healthcare users provide detailed information on various healthcare products. Such interactions often take place in an instrumental way. They rarely have a social-emotional component, such as a user expressing anger towards a particular health product. Interactions are mostly general and do not concern personal experiences but somewhat objective information or a general review of a health product that those who have posted have not personally used. Interactions are afforded by easy editability. In collaborative projects, these interactions occur between a limited number of actors who do not really associate with each other but instead with the content. Thus, the affordance of association with the content is essential as illustrated in the case of collaborative community Natural Health Wiki that reflects changes in the content by different users, but not many comments or communication with other users. These interactions pertain to general topics on health products and do not provide a basis for generating new interactions, thus offer low generativity. However, they afford informal control. A typical example is shown below:

Post (user): ... *announced availability of a new FDA-approved generic test strip, and at the same time, we got word that the green-colored GenStrip alternative test strip ...*

Comment (user): ... *the UniStrip1 test strips are cleared by the FDA for use with the LifeScan OneTouch Ultra, Ultra 2, UltraMini and UltraSmart.*

Empathizing with fellow sufferers: Social networking sites afford interactions characterized as empathizing with fellow sufferers since these provide high editability and association. In particular, the users are able to see pictures and visit profiles of other users as well as exchange chat messages, which makes it easier to associate with others in the platform. Simultaneously, the constellation of users, who are solely or mainly healthcare users, also contributes to the emergence of interactions. These interactions have an informal scope of control and low generativity. For example, the social networking site of Boston Children on Facebook afforded the users to check out each other’s profiles, like, and edit the comments. The following examples illustrate informal control, but also low generativity as the comments remain to be about the topic of the original post and do not lead to the discussion of new topics: “... *Today, we’re proud to share ESPN’s story of one brave survivor, Boston Children’s patient, ...*” followed by the comments such as “*such a great and uplifting story of hope!*” “*Such a beautiful story! Wishing you all the best in achieving your dreams!*”. The low generativity reflects that these interactions do not enable the generation of many new topics or avenues

for discussion and that they stay pretty removed from the medical content of the condition. The knowledge sharing between users is somewhat limited as they do not share explicit information on the conditions.

These interactions are usually initiated by healthcare users who talk about their health conditions and experiences. Other healthcare users engage in the interaction by empathizing with the original user and expressing their emotional support. Such interactions are mainly focused on the personal conditions of the healthcare users who initiate them. The content is usually expressed in a social-emotional way, with the healthcare users showing solidarity and raising the healthcare user’s status who initiated the discussion. In cases where providers participate in the interactions, their posts also tend to provide emotional support to healthcare users. Although these interactions mostly occur on social networking sites providing an easy way to share and comment and thus generate new discussions, this affordance was not often actualized, and interactions usually remain focused on offering words of support or comfort, offering low generativity. The following example from the platform, Lose weight Jo! illustrates this archetype:

Post (user): *This is so me! Sharing photo: I work out because it is good for me. Also, because I like to eat. A lot.*

Comment (user): *Yep I’m with ya sista!!)*

Lifestyle support: Lifestyle support interactions mainly occur in content communities, which afford easy sharing of different diets, exercises, and other lifestyle suggestions focusing on health prevention. Platforms’ intended use is particular and explicit, focused on maintaining a healthy lifestyle and avoiding diseases. By affording high generativity, these communities allow the emergence of interactions. For example, the content community of Everydayhealth posting videos about weight loss and other prevention-related topics included comments ranging from commenting exercises “... *I got here from 5 finger death punch ...*”, motivating each other “... *keep exercising!!*” to discussions about preventing health conditions “... *what about men then, they can get breast cancer also ... breast and prostate the two biggest killers ...*”. Next to high generativity, these interactions have an informal type of control. Informal control affords easy and relaxed communication between users and “lifestyle gurus” leading to various types of lifestyle interactions as generativity is high. An example from BeautifulBrwnBabyDol illustrates this informal control and communication between the users: “*U are such an inspiration. Thank u for ur vids*” and “*What I love about you, is that your happiness comes from the inside, and not the outside*”. Through this, healthcare users build their knowledge on many topics and enter into various discussions to help them be proactive about their health and take concrete prevention-related actions as illustrated in the quote from the same platform “*Recently I started a low-carb high-protein diet, in order to get sugars and bad carbs out of my life ...*”.

These interactions are initiated mainly by healthcare users and aimed at other users. They have an educational character that is reflected in the detailed explanations of, for example, how to do specific exercises. These interactions have a strong focus on prevention and never deal with the content and discussions that relate to particular diseases. In particular, they strongly emphasize topics such as weight loss. The healthcare users attempt to guide others and promote a healthy lifestyle by talking about their experiences as well as general topics. They both express and ask questions on the topics. This archetype’s posts mainly reflect an instrumental communication method in which users and providers want to transfer information straightforwardly and objectively. These interactions are spread across all categories of social media, although content communities are often used. They afford easy sharing of different diets, exercises, and other lifestyle suggestions. Interactions are relatively informal, with little hierarchy between users who promote healthy lifestyles and their “followers” who engage in communication. Below is an example of this archetype from the Everydayhealth platform:

Post (user): YouTube video showing exercises for arms.

Comment (user): *Thank you Holly! Yes, this is helping me to tone my*

arms.

Table 2 presents the results of our ANOVA analysis usually used with K-means clustering to test the null hypothesis that no significant differences exist among the cluster centers. Results presented in Table 2 show that our archetypical interactions are significantly different from each other on all variables except for general vs. specific. Specifically, we compared the clusters' mean scores on the variables through one-way ANOVA testing to observe the key differences between our archetypes. ANOVA results revealed that the F value is significant for variables ($p < 0.05$), which indicates that our archetypes (i.e., clusters) are significantly different. Hence, this rejects the null hypothesis of ANOVA (i.e., that there are no significant differences between clusters), which along with the descriptive statistics, shows that our five archetypes differ from each other across different social media categories and participating actors.

Based on the dimensions of generativity and control, we categorize our five archetypical interactions in a taxonomy as presented in Fig. 1.

6. Discussion

Our key finding is identifying five archetypical interactions in health-related social media use and placing them in the taxonomy along the dimensions of control and generativity affordances. Our findings indicate that the concept of informational support in healthcare, as described in the recent literature, may be too generic to provide a meaningful understanding of what is taking place. We find that informational support includes three distinct and unique use types, as indicated in our archetypes: resolving personal health conditions, informing about healthcare products, and knowledge-building through teaching. This differentiation between subtypes of the broad idea of informational support has not been previously described. This may enable a better understanding of why social media use for informational support has had mixed success in patient outcomes and doctor-patient relationships (Rupert et al., 2014; Wentzer and Bygholm, 2013).

In particular, these three distinct subtypes of informational support differ in terms of the control and generativity affordances. In this respect, different interactions and specific types of use with different affordances may reduce that information asymmetry in a different way. For example, whereas informing about healthcare products and knowledge building through teaching reflects the low level of generativity, the archetypical interaction of personal health conditions reflects the high generativity level. This implies that those engaging in interactions about personal health conditions easily generate new topics and conversations that could make them more knowledgeable about medical topics than those engaging in the two other types, which could eventually lead to a higher reduction in information asymmetry between patients and their doctors, which represents one of the key determinants in doctor-patient relationships (Pilnick and Dingwall, 2011).

A fourth archetypical social media use, empathizing with fellow sufferers, confirms the generally held notion that emotional support is an

essential form of social media use by patients in a healthcare context (Huang et al., 2019). Our analysis indicates that this form of support does not have meaningful subtypes. Finally, we uncovered a new type of online health-related social media use, one previously unaddressed in the literature, which we call lifestyle support. Whereas earlier research, and the broad concepts of emotional and informational support, have mainly investigated contexts in which patients are already suffering from some form of ill-health (Antheunis et al., 2013; Rupert et al., 2014), we have concluded that interactions on social media reflecting lifestyle support are a distinct type of use in the healthcare context, focusing on prevention.

We have placed these five archetypes in a taxonomy, which is another novel output of this study and one that goes some way to answering the call for research on exploring social media in healthcare (Terrasse et al., 2019). We have demonstrated that specific categories of social media may specifically afford some interactions, and we indicate the actors who participate in these interactions. For example, empathizing with fellow sufferers is afforded mainly by social networking sites such as Facebook and involves healthcare users. In this respect, drawing on the affordances perspective and identifying them is important as the affordances provided by new digital technologies can affect doctor-patient interactions (Marent and Henwood, 2021; Trondsen et al., 2018). Given the social media affordances, we argue that this may also affect the doctor-patient relationship in different ways.

On the one hand, the interactions that are attempting to resolve a personal health condition reflected easy editability of posts and association with users and content. This combination of technological affordances with very specific communication between actors reflected a formal type of control adhering to the traditional role of the doctor being in charge, but it also had high generativity. This enables users to start new discussions and extend patients' knowledge on different aspects of their conditions. Thus, this may lead to the situation in which patients see themselves as the actor with key expertise, potentially affecting the doctor's task-focused behavior.

On the other hand, empathizing with fellow sufferers also reflected high editability and association. However, these interactions have an informal scope of control and low generativity. Having an informal scope of control and low generativity means that the communication is relaxed and that no new topics for discussion emerge, staying away from the medical content of the condition. This implies that patient-to-patient online interactions may replace any social-emotional component of the medical encounter in the doctor-patient relationship. Hence, this type of interaction may have more effect on the social-emotional part of the doctor-patient relationship.

Focus of our paper was to identify and categorize social media enabled interactions in healthcare, choosing the dimensions of control and generativity. On the one hand, given that affordances emerge in the space between technologies and action taken, the selection of only two affordances to categorize the interactions may somewhat present a limitation for broader generalizability. On the other hand, however, it is

Table 2
ANOVA results (complementary variables).

Variable	Personal health condition resolution	Knowledge-building through teaching	Informing about healthcare products	Empathizing with fellow sufferers	Lifestyle support	ANOVA
<i>Platform characteristics</i>	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	F
Blogs	.22 (.42)	.43 (.49)	.45 (.49)	.29 (.45)	.24 (.42)	15.28*
Social networking sites	.24 (.41)	.18 (.38)	.17 (.37)	.44 (.49)	.24 (.42)	21.25*
Collaborative projects	.26 (.44)	.14 (.34)	.35 (.47)	.00 (.00)	.22 (.41)	40.71*
Content communities	.28 (.44)	.25 (.43)	.03 (.17)	.27 (.44)	.30 (.45)	17.60*
Provider vs. User	.41 (.49)	.38 (.48)	.35 (.47)	.51 (.50)	.44 (.49)	4.59*
General vs. Specific	.49 (.50)	.55 (.49)	.60 (.49)	.54 (.49)	.51 (.50)	2.11

* $p < 0.05$.

a good basis for mid-range theory development that is linked to specific technology and usage setting but also allows for a certain degree of generalizability (Volkoff and Strong, 2013).

Overall, our work facilitates a better understanding of the use of social media, and our taxonomy enables other researchers to theorize about social media-enabled interactions along two dimensions, which are important from both the affordances and the doctor-patient relationship perspectives.

7. Conclusion

The primary goal of our paper was to present the taxonomy of social media-enabled interactions in healthcare. The affordance lens helped us to identify five archetypal interactions and organize them in the taxonomy along the dimensions of control and generativity affordances as important concepts for the doctor-patient relationships. Hence, our taxonomy is intended to provide a clear and systematic overview of the interactions that can stimulate future research regarding their effects on doctor-patient interactions. In addition, it can help patients to understand how particular types of social media-enabled interactions can enhance the patient community. Furthermore, individual healthcare providers, such as doctors, can also use the taxonomy to recommend certain types of interactions to their patients that are consistent with their healthcare providers.

8. Limitations and future research

The scope of this paper has been to create a taxonomy rather than to

empirically assess the effects of the different archetypal interactions on how healthcare professionals work and fulfill their roles. Future research is needed to build upon our findings, for example, by empirically testing how and to what extent different interactions identified in the taxonomy affect the relationship between patients and their doctors. In line with this, we encourage future researchers to focus on testing the identified archetypal interactions. We expect that the interactions deeply focused on resolving personal health conditions may have different effects than, for example, interactions focused on lifestyle support that has preventive character. Furthermore, we call on a more in-depth exploration of emotional support in the use of social media in healthcare. Whereas we identified distinct types of informational support, we identified only one type of emotional support. This could reflect a limitation in the cases we selected. Hence, we call for future researchers to focus on an in-depth exploration of the cases oriented on emotional support to explore if subtypes of emotional support can be identified. Future research could also benefit from applying the recently proposed framework of Marent and Henwood (2021) to explore how each of the interactions identified in this study affects the roles and responsibilities of doctors and patients by focusing on more broad dimensions of spatial, temporal, and social affordances.

Credit author statement

Smailhodzic: conceptualization, methodology, formal analysis, investigation, writing – original draft. Boonstra: conceptualization, methodology, writing – review & editing. Langley: conceptualization, methodology, writing – review & editing.

Appendix A

List of cases.

Platform General/Specific	Provider initiated	User initiated
Blogs		
General	Harvard medical blog	E-patient Dave
Specific	James Hamblin	Diabetes mine
Social Networking Sites		
General	Boston Children’s Hospital	Medhelp
Specific	Dr. Eisenberg	Lose weight Jo!
Content communities		
General	Everydayhealth	BeautifulBrwnBabyDol
Specific	Endobariatric	Patient power
Collaborative projects		
General	WikiDoc	Natural health wiki
Specific		Street Medic Wikia
Virtual Game Worlds		
General	Vitalis Island STBBI Clinic	
Virtual Social Worlds		
General	Lil Angels Maternity	First Health Hospital
Specific	Krystal’s Therapy	G.Y.M. Body & Fitness

Appendix B

Details of data analysis.

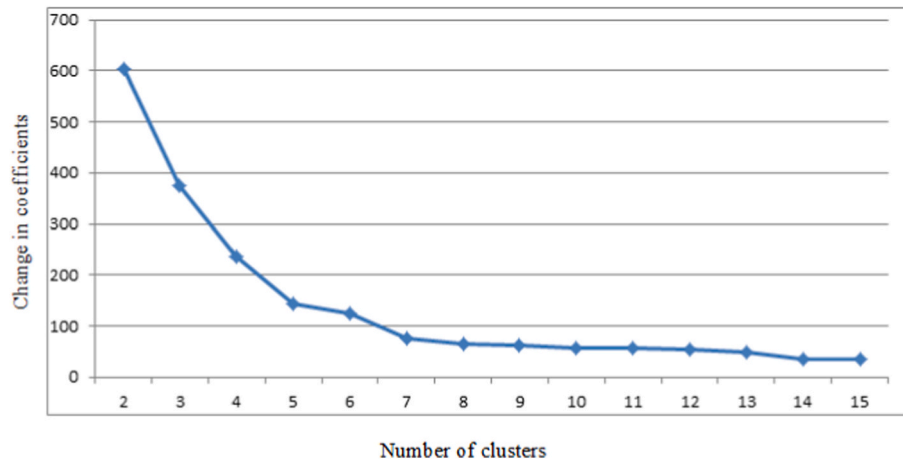
Phase	Aim	Data	Theoretical coding	Analytical induction	Statistical analysis	Finding
1	To uncover initial topics and nature of communication.	1727 quotes	15 codes describing the topic/theme of interactions and nature of communication.	Initial idea on archetypal interactions.	N/A	Initial review of different types of interactions between healthcare actors.
2			N/A	N/A		

(continued on next page)

(continued)

Phase	Aim	Data	Theoretical coding	Analytical induction	Statistical analysis	Finding
3	To identify archetypal interactions. To place archetypal interactions in a taxonomy.	1566 quotes 5 archetypes		Analysis of the control and generativity affordances in archetypes.	Cluster analysis and ANOVA. N/A	Five archetypal interactions and differences between them. Five archetypes placed in 2 × 2 taxonomy.

Appendix C



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