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E-Health Innovations, Collaboration, and Healthcare Disparities: Developing Criteria for Culturally Competent Evaluation

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E-Health alters how health care clinicians, institutions, patients, caregivers, families, advocates, and researchers collaborate. Few guidelines exist to evaluate the impact of social technologies on furthering family health and even less on their capacity to ameliorate health disparities. Health social media tools that help develop, sustain, and strengthen the collaborative health agenda may prove useful to ameliorate health care inequities; the linkage should not, however, be taken for granted. In this article we propose a classification of emerging social technologies in health care with the purpose of developing evaluative criteria that assess their ability to foster collaboration and positively impact health care equity. The findings are based on systematic Internet ethnographic observations, a qualitative analysis of e-health tool exemplars, and a review of the literature. To triangulate data collection and analysis, the research team consulted with social media health care experts in making recommendations for evaluation criteria. Selected cases illustrate the analytical conclusions. Lines of research that are needed to accurately rate and reliably measure the ability of social media e-health offerings to address health disparities are proposed.

Keywords: e-health, health disparities, health care disparities, social media, information communication technologies, collaborative health

Culturally Competent Evaluation of E-Health Initiatives

Emerging information and communications technologies (ICT) enable new ways of archiving, creating, and searching for health information (Fox, 2011), hypothetically accelerating and deepening collaborative health care opportunities. ICT defy the financial, geographical, and logistical barriers that exist in creating a context for ongoing interaction, easy access to information, and collaborative learning. A variety of ICT support the development and maintenance of relationships that overcome geographical distance and time constraints, increase transparency, and enable better community outreach and participation. Besides obtaining information, searching, and archiving, emerging ICT foster the creation of new media in the form of narratives, stories, and other forms of expressions that transform consumers into active producers of information (Eysenbach, 2008). For self-help and support groups, for instance, the advantages are substantial; their development can be sustained and invigorated through virtual social networks (Griffiths, Crisp, Christensen, Mackinnon, & Bennett, 2010; van Uden-Kraan, Drossaert, Taal, Seydel, & Laar, 2010). Therefore, emerging social media can significantly alter how people participate in their health management and the ability of patients and various health care providers to collaborate more effec-

tively and, hypothetically, reduce health care disparities.

New technologies develop at an accelerated rate, and it seems logical to predict their potential for addressing access and quality issues related to the active participation of patients in their care, and the health care system's ability to effectively reach more patients. To innovate, however, is challenging, but the dissemination of new technologies is even more complex (Berwick, 2003). This is especially relevant in the case of low-income segments of the population (Chu, Huber, Mastel-Smith, & Cesario, 2009; Kim et al., 2009), racial and ethnic minority populations (Roblin, Houston, Allison, Joski, & Becker, 2009; Tsai, Taylor, & Tu, 2010; Veil & Rodgers, 2010; Viswanath & Emmons, 2009), English language learners (Muñoz, 2010), those with low levels of health literacy (Bodie & Dutta, 2008; Mayberry, Kripalani, Rothman, & Osborn, 2011; Vargas, Robles, Harris, & Radford, 2010), and other vulnerable populations (Hardiker & Grant, 2011). However, the digital divide is not solely dictated by socioeconomic factors and health literacy barriers but largely by what health care institutions choose to implement. The information technology tools, for instance, that have been adopted and shaped by early users may impose problems to underserved and vulnerable populations—the outcome, often, of deploying tools that most patients are not already using and/or can easily access. Moreover, including the health issues faced by vulnerable populations as well as the cultural contexts in which they live is critical in developing digital tools that aim to reduce health care disparities (M. C. Gibbons, 2005; M. C. Gibbons et al., 2011). Therefore, class, race, and disability must be key factors in determining which technologies health care providers should employ (Guzman, Mireles, Christopherson, & Janning, 2010; Lorence, Park, & Fox, 2006).

Ultimately, the convergence of active and empowered patient communities and specialized technologies (Ferguson & The E-Patient Scholars Editorial Team, 2007) has the potential of reducing health care inequality. In examining social media that may impact health care practice, we identified three distinct frameworks that intersected in our design and data analysis: collaborative family health care, e-health, and

health care equity—including social justice and cultural competence.

E-Health

E-health definitions are still evolving. e-health may be defined in terms of a continuum of integration of health information technologies, with electronic health records on one end to sophisticated ways in which patients manage their health more autonomously at the other. Other terms used to conceptualize the intersection of digital technology and health are "Health 2.0" and a subset of practices denominated "Medicine 2.0" (Hughes, Joshi, & Wareham, 2008). Medicine 2.0 has emphasized the use of digital technologies to enhance doctor-patient communication in what the research literature defines as personalized health care (Hughes et al., 2008). According to van de Belt, Engelen, Berben, and Schoonhoven (2010), e-health describes the convergence of social media applications and health management. The World Health Organization defines e-health as "the transfer of health resources and health care electronic means" (Fokkenrood et al., 2012, p. 258). However, definitions are a contested territory: the term *Health 2.0*, for instance is a registered trademark. One well-documented form of e-health practice is patients organizing autonomously through virtual communities to learn about managing their health conditions, connect with others experiencing similar health concerns, and finding support. According to a review by Barak, Boniel-Nissim, and Suler (2008), patients' involvement in their health management has been associated with a sense of empowerment as patients are not solely relying on health care professionals but connecting with each another for information and health care advice.

The term "E-patient" has emerged to describe patients who are using the Internet and social media tools to take charge of their health. E-Patients are "equipped, enabled, empowered, and engaged in their health and health care decisions" (Fergurson & The E-Patient Scholars Editorial Team, 2007, p. ii). Given the increasing volume of patients who are capitalizing on the existence of Internet tools to manage their health, both patients and health care providers would benefit from increased participation in the e-health environment (Epstein, 2008). The

E-patient and the family health systems paradigms underlying assumptions are complementary. Both emphasize the need for collaboration among patients, family, traditional health care providers, and other professionals. The collaborative health movement has emphasized interdisciplinary relationships and an attention to systems thinking, in particular the patient in the context of family. Complementarily, the E-patient movement has emphasized information sharing, informed decision-making, self-advocacy, and patient social networking as some of its core practices. The collaborative health movement had developed sophisticated models and proven that interprofessional and integrated care are core while the E-patient movement has embraced the potential of health information technology and virtual social environments for providing patient centered care. Despite their sophistication, neither of these paradigms has been strong at incorporating the challenges posed by health care disparities.

Collaborative Health Care

The collaborative health movement advocates for the integration of mental and physical care, including the patient's family as an intrinsic piece in the health intervention, and in which the professionals and institutions work together with the patient (Bacigalupe, 2011). Its emphasis has been, for the most part, on the coordination of care by different professionals utilizing a systemic or relational framework—the patient in the context of family (Blount, 1998; Rolland, 1994). Several permutations of relationships can exist among those who participate in health care interactions: (a) health care providers involved in the coordination of patients' care; (b) patients; (c) patients' family members and caregivers; (d) researchers; and (e) community of patients and advocates.

Not fully developed is the inclusion, in this framework, of health care administrators, the pharmaceutical industry, policymakers, business, and other participants who have a direct and indirect role in the implementation of health care interventions and are key parties involved in patients' health. Working with communities of patients and/or having researchers respond to requests by patients had been scarce until the emergence of virtual social networks (Hesse et al., 2011). The opportunity to foster exchanges among these various players could be strengthened with the advent of technological platforms for communication and collaboration. Such exchanges could, in turn, bolster ecosystemic assessments and interventions to address the complex task of ameliorating inequity within the health care system.

Health Equity

The research evidence addressing the impact of economic and social disparities on the physical, social, mental, and emotional well being of people, as well as the quality of health care services is irrefutable and extensive (C.P. Jones, Jones, Perry, Barclay, & Jones, 2009; Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; R. Wilkinson & Pickett, 2008; R. G. Wilkinson, 1997). Evidence to support racial and ethnic disparities in the health care system is consistent across a range of illnesses and health care services, even when researchers adjust for significant confounding variables like socioeconomic status (Agency for Health care Research & Quality, 2004, 2010). The analogy of a gardener planting a flowerpot illustrates how institutionalized, personally mediated, and internalized racism interact and influence wellbeing (C. P. Jones, 2000). In this analogy, first, the gardener separates red and pink flower seeds into two different boxes, planting the favored red seeds in fertile soil and the disfavored pink seeds in rocky soil. When the red flower seeds produce vibrant and thriving blossoms and the pink flower seeds do not, the gardener exclaims, "I was right to prefer red over pink! Look how vibrant and beautiful the red flowers look, and see how pitiful and scrawny the pink flowers look!" (pp. 1213–1214) Jones compared both the gardener's exclamation as well as the initial separation of the seeds with institutional racism as the gardener ignores the influence of the soil on the outcome of the blossoms and instead attributes the vibrancy of the red blossoms to red being intrinsically superior to pink. In this metaphor, personally mediated racism is illustrated is the gardener removing pink flower blossoms that have blown over into the fertile soil box before they can establish themselves and bloom. Finally, internalized racism is illustrated when a bee attempts to pollinate the pink flowers and the pink flowers yell, "Stop! Don't bring me any of that pink pollen—I prefer red!"

(p. 1214) believing that the red flower seeds produced healthier blossoms because red is truly better than pink. Ultimately, Jones (2000) has argued that addressing institutionalized racism is critical in attempting to impact health disparities.

Inequity and inequality are often defined as synonymous, but they are distinct. Inequality refers to health outcomes in relation to access and quality of health care services. Inequity also includes the level of vulnerability related to institutional and social factors that have an impact on health outcomes. In a later article, Jones et al. (2009) attributed the existence of health disparities to differences in quality of care, differences in access to care, and differences in initial health status resulting from environmental and social factors. Using the analogy of a cliff, she described how community leaders and policymakers may consider dedicating the majority of health care resources to distancing people from the cliff, or addressing both the social determinants of health, such as poverty, and the social determinants of equity, such as racism and sexism. Both the cliff and gardener analogies demand from community leaders and policymakers to address disparities in health care service by focusing on the institutionalized factors that allow for inequity to exist.

Cultural competency strategies, one of the most common responses of the health care system to address health disparities, focus on two of the dimensions health, various levels of prevention and equitable intervention, rather than purely the health care system's response to a diverse population. If the virtualization of health care interactions expands and offers the opportunity for a better quality of care, then we are to ask to what extend do these ICT tools further or ameliorate disparities and inequity (M. C. Gibbons et al., 2011). This article intends to advance in the development of a model that assess the potential of social media tools to address perennial health care quality and access inequities in the United States.

Method

To develop criteria to assess social media tools, the research team adopted several techniques to systematically analyze an evolving set of technologies. We used a modified form of online ethnography or "netnography" (Kozi-nets, 2010), case analysis, and consultation with experts. The qualitative data collection process was guided by an iterative selection of e-health tools through online ethnographic observations, the selection of cases, and the development of categories and criteria supported by consultation with experts in health care and social media. We attempted to choose which sites were more relevant based on their reputation as measured by traffic but were not considered for this study because they were designed mostly for marketing purposes. Site traffic does not necessarily provide a measure of credibility, reliability, and quality—the variables we intended to explore. Guided by the broad research question of which types of health social media applications or e-health tools could enhance collaboration among patients, caretakers, and health care professionals, we refined the criteria for inclusion of e-health tools based on variables that emerged on an iterative basis. To identify key concepts and themes that related closely to collaboration, the team collected free-text narrative data (EPPI-Centre, 2007) available publicly on Web sites focused on the utilization of social media for health care purposes.

Ongoing consultation with a dozen social media health care and e-health experts provided the basis for a draft table with a list of e-health tools. We started our observations through an ethnographic search of social networks using *Academia*, *Facebook*, and *Twitter*. The list was refined through a comparison with a review of referenced works from scholarly articles retrieved via *Google Scholar*, *GoPubmed*, *Lexis-Nexis, Library of Medicine*, *PubMed*, and the digital holdings of three research university libraries. Two white paper reports (Sarasohn-Kahn, 2008a, 2008b) that analyzed how online and mobile tools were helping both doctors and patients manage chronic illnesses served to corroborate the trustworthiness of the e-health tools list because the initial data gathering began a year before these reports were made available. We also used social media outlets to investigate e-health tools because research publications were still scarce at the time. *Science Roll*, a blog published by Bertalan Meskó, a pioneer in the introduction of social media in the training of physicians, led us to a host of sites that offered virtual communities of patients with chronic illness as well as updated information on mobile health applications for

both patients and health care providers. A team composed of three researchers independently assessed the tools and agreement was reached through comparative analysis. Feedback by e-health and health care social media experts aided in making this assessment trustworthy.

The initial criteria that guided the selection of our cases are what we named the "e-health" and "platform" cores. A tool to be included in our list had to meet two conditions—one related to content (health) and the other to process (technology). A tool in the e-health core was included because its primary goal was to focus on health care and was directed solely to patients, or to health care providers, or to both patients and health care providers. The second basic criterion was the platform core, which considered three variables: functionality, frequency of use, and neutrality. A functional tool should not have had broken links, was not a link to drive viewers to another site that marketed a product, and was easily recognizable as a full site with its own domain. Frequency of use meant that the site had noticeable activity—regular updates, redesigns that improve it, and/or interaction among individuals occurred on an ongoing basis. Platform neutrality required that to interact with the Web site did not require a specific computer software platform (Microsoft, OSX, or Ubuntu) and that they worked across all main available Web browsers at the time (Explorer, Firefox, Safari). We eliminated tools that were inactive during the previous month when applicable—that is, several online social networking health sites appeared and disappeared during this period of time. We also eliminated tools that were evolving so rapidly that it was difficult to classify them. For example, *MySelfHelp* was originally funded by National Institutes of Health (NIH) research to create a virtual support for Latino patients who might be suffering from symptoms of depression. During the funding period, *MySelfHelp* was made widely available and transformed into a service that anyone could access but with limited reach. When NIH funding ended, the tool went through three different owners, while the original tool was finally morphed into one of many services that a large private health care conglomerate offers as one of several services and not freely available anymore. We identified a total of 89 e-health tools in the spring of 2012 that fulfilled these criteria.[1] It should be noted that the team iden-

tified at least as many e-health tools that were emerging or under development; therefore, they did not yet meet the criteria for inclusion in our analysis.

To triangulate the data collection and analysis upon completion of a comprehensive list of e-health tools and the identified variables, media health care experts were invited to review our database via open invitation to two social media and health care virtual social networks *#HCSM* (http://healthsocmed.com) and *#HCSMEU* (http://hcsmeu.wikispaces.com). Through participation in these networks, the first author invited media health care experts to collaborate. Twelve individuals who were recognized by their peers as health care social media experts accepted the invitation. The emerging database was located in *GoogleDocs* and was periodically made accessible to consultants and experts in health care and social media for their review. These experts suggested additional sites, provided feedback that nourished the data analysis—that is, through their feedback the case and criteria selection was refined. Trustworthiness emerged, therefore, not only from a continuous comparison process among three researchers but also from verification by experts.

The identification of categories occurred while criteria for Web 2.0 health care sites were also being developed by *Health On The Net Foundation* (HON) (Boyer, Baujard, & Geissbuhler, 2011; Laversin, Baujard, Gaudinat, Simonet, & Boyer, 2011). The HON offered a credentialing process for health care sites to become recognized as sources of quality and reliable health information based on eight principles: authority (qualifications of the authors), complementarity (information supports, not replaces, doctor-patient relationship), attribution (sources cited), privacy (user identity and medical information is confidential and protected), justifiability (all endorsements are supported by balanced evidence), transparency (contact information provided), financial disclosure (financial contributors of all types are listed), and advertising (advertising policy is listed). The HON definition of collaboration is similar to how we have defined the platform core: Web sites hav-

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[1] The database containing the complete list of e-health tools can be requested from the principal author.

ing discussion forums, social networking sites, file sharing sites, wikis and blogs, among others. We define Web 2.0 as all sites/platforms where the user can interact with the content and/or with others (Health on the Net Foundation, 2011).

In our study, reliability was defined according to the HON certification guides. Transparency is arguably the most important principle; the HON certification aims at developing guidelines that are relevant to the health care Web sites with maximum transparency (Wetherall et al., 2011). Privacy certification is an important dimension in the case of health care that the HONE includes. During the data collection, the team learned that many health care Web sites were being certified by TRUSTe as complying with privacy guidelines (TRUSTe, 2010). Sites that obtain HON certification and meet privacy requirements, which may offer users an initial foundation of trust and security, that can foster collaborative relationships. To evaluate the sites, privacy, in this project, was defined according to these guidelines.

Results

To assess both collaboration potential and the potential to address health disparities, we identified eight categories of e-health tools and a set of variables. For each category we selected a

case that highlights the characteristics of each tool category. The selected cases, however, are not necessarily those that rank the highest in their ability to foster collaboration or address health disparities. Our analysis of the selected cases seeks to offer both our observations of what currently exists in the e-health field and our considerations of what a tool must include in order to foster collaboration and impact disparities in health care. Table 1 includes the descriptive categories and one case example per category. Under case analyses, we provide a description of each category and selected case.

Assessing Collaboration and Health Disparities

In evaluating the potential of a tool to both foster collaboration and address health disparities, we considered several criteria. In terms of collaboration, we considered authorship (creator of tool content), audience (target population for which tool was designed), and primary direction of communication (unidirectional or bidirectional). For a tool to demonstrate the highest potential for collaboration it had to allow for patients and health providers to equally engage in decision-making regarding patient health.

To assess a tool's potential to address health disparities, we use the following criteria: inclu-

Table 1
E-Health Tool Categories

Categories	Purpose	Cases
Knowledge Information Resource	To allow any Internet user to add and edit content.	Map of Medicine www.mapofmedicine.com
E-Clinical Networks	For exclusive use of health care professionals to meet and interact.	Ozmosis www.ozmosis.com
E-Patient + E-Provider Networks	Patients and professionals collaborate; often clinicians have a formal role.	HealthCentral www.healthcentral.com
E-Patient Networks	For patients often with the same health conditions and/or caregivers and families meet and interact.	PatientsLikeMe www.patientslikeme.com
Health Research Networks	For researchers to interact focusing on research issues.	BioMedExperts www.biomedexperts.com
Public Health E-Health and Health Prevention	To implement interactive public health programs and health care prevention.	TxT4baby www.hmhb.org
Self Tracking	To encourage health management through self-observation, also identified as quantified self-tracking (Mehta, 2011)	Zeo Sleep Manager Mobile www.myzeo.com/sleep
E-Care Practices	For health care professionals to provide services to patients remotely.	Hawaii Medical Service Association (HMSA) Online http://consumersonline.hmsa.com

sion of photos of underserved populations, availability of the tool in multiple languages, and relevance of health topics to underserved populations. The Cultural Competence Continuum (NC Division of Mental Health, 2011) also formed the basis of assessing a tool's potential to address health disparities.

The study of the Web sites' main features included the identification of a set of variables that was iteratively refined. The variables guiding the evaluation of the collaboration core were authorship, target audience, primary direction of communication, and potential to address health disparities. In the technical core, we assessed the number of hits, interoperability, and functionality.

To assess collaborative potential, we weighted each of the variables above to categorize the tool with a Likert scale that run from "very low" to "very high" (see Table 2).

Collaboration Core

Audience. The target population for which the tool was designed or the recipients of the information disseminated by the Web site. It included a large array of potential participants: patients, family members, health care professionals, health care institutions, researchers, students, private business, government agencies, financial service firms, foundations, corporations, professional organizations, journal editors, Web publishers, and the public.

Authorship. Content creation and assessed if only patients were authoring and exchanging information via the tool or clinical or research experts were also involved in the exchange. The author of a tool is the creator of the tool and/or those that disseminated information through the identified virtual platform.

Primary direction of communication. The extent to which creators and users were able to collaborate in the ongoing functioning of the virtual platform. Communication direction is unidirectional when creators communicate information to users, or bidirectional when creators and users interact and the tool existence depends on interaction between creators and users.

Potential to address health disparities. The extent to which a tool may address the needs of underserved populations—creating better access and/or increased quality of care.

Technical Core

Functionality. A tool fulfilled this criterion if it was functioning according to what was promised to its visitors. Only those tools that fulfilled this criterion were included in the study.

Interoperability. The capability of the tool to be used with multiple platforms (i.e., computers and mobile phones), thereby granting users greater access to the tool as users do not need one specific device to interact with others.

Emerging Variables

As new data emerged, further in the iterative analysis of existing e-health tools and the research literature, emerging variables were selected, broadening the criteria to include ownership, profit, purpose, source, and management.

Ownership and management. The entity that has ultimate control of the tool, either an individual, company, nonprofit organization, university, or government entity, as well as entity that maintained the tool, either an individual

Table 2
Social Media: Content Modification and Collaboration

Degree	#	Social media	Collaborative health
Very low	1	Users solely consume content.	One health care professional is the expert.
Low	2	Users comment on content.	Health care professionals are the experts.
Moderate	3	Users interact and modify content.	Several health professionals provide feedback.
High	4	Users interact, modify, and create content.	Interdisciplinary health professionals and patients collaborate.
Very high	5	Prosumers; users interact, modify and create content, and develop virtual community.	Health professionals and patients are equally engaged in decision-making regarding patient health.

or a team, and included securing funding and keeping the tool up-to-date and functional.

Cost of access. Assessed if users are charged or not to use the tool. *PatientsLikeMe* provides a platform for patients, health care professionals, and health care industry organizations to connect at no cost to users. On the contrary, *HealthMedia Solutions* requires a paid membership to obtain a personalized health plan.

Purpose. The intent of the tool: research dissemination, academic, health management, information dissemination, information exchange, support, research, and social networking.

Source. The data that served as the basis for the content disseminated by the tool, such as personal experience, clinical practice, research outcomes, and news media.

Potential to Address Health Disparities

To explore the tools' potential for addressing health disparities, the team assessed whether the platform included health topics that were of significance to underserved populations, multiple languages, and if minority populations were represented in the Web site (i.e., photos). For a global assessment, we also adopted the categories enumerated in the Cultural Competence Continuum to classify the tool (see Table 3). It was, however, difficult and complex to assess whether a tool was directed to ameliorate health disparities. A strict application of these criteria would lead evaluators to conclude that the majority of the e-health tool offerings are culturally blind. Sites that had as an explicit purpose to address health disparities were the exception— that is, multilingual sites that are common in Europe were absent in U.S. sites. E-health tools

inclusion of concerns about inequity appeared as secondary or was invisible to end-users.

Case Analyses

Knowledge-based information resources. A knowledge-based information resource is an Internet Web site that provides tools for organizing data, searching information, and reporting in an integrated fashion. It is not simply text based information; it is cumulative and "contributes to a growing body of knowledge" (O'Carroll, 2003, p. 354). The *Map of Medicine* (*MoM*) (Brennan, Mattick, & Ellis, 2011) was designed to improve communication between primary and secondary care clinicians after the creators noticed that the "quality of the referrals" they were receiving at a large teaching hospital impacted waiting times. *MoM* is designed to assist health care communities in reducing costs and improving quality of care by decreasing, for example, the volume of inappropriate referrals and the differences in community-based and specialist care. Various health care providers create flowcharts, or "care maps" to share best practices, knowledge, and research findings with each other. Health care providers may use care maps to impact all levels of health care service delivery from enhancing patient care to improving referral processes. *MoM* specialists and clinicians verify the accuracy of each care map through a standard review process. Additionally, each care map is reviewed to ensure that care maps are reliable and up-to-date. *MoM* does not include a "privacy seal" on its Web site, but has its own privacy policy. *MoM* is currently owned by Hearst Corporation and is managed by a team composed of a managing director, medical director, sales director, and IT director. *MoM* also has a number of

Table 3
Cultural Competency Continuum Criteria

Cultural incapacity	1	Disregards difference.
Cultural blindness	2	Does not focus on underserved populations or does not intend to; perpetuates stereotypes.
Cultural pre-competence	3	Visual representation of all ethnic groups, gender, etc., as valued community members; acknowledges cultural adaptations.
Cultural competence	4	Universal access; emphasis/value of difference; family-oriented; used by/informed about underserved populations.
Cultural proficiency	5	Offers languages that meet the needs of underserved populations; proactive; serve as model to other tools; systemically oriented.

partners and clinical providers that work to ensure the accuracy and quality of care maps.

MoM's collaboration potential was rated as moderate given that it allows health care providers to be a resource for each other but not for exchanging information with patients. The primary direction of communication is unidirectional with the decision-making flowcharts being designed by a panel of experts rather than through crowdsourcing. *MoM* provides translation of its resources into languages other than English if contracted and in conjunction with users. Additionally, it participates in the World Health Organization's (WHO) Sharing eHealth Intellectual Property for Development (SHIPD) initiative, which aims at offering e-health technologies to developing countries. Based on these commitments, this tool was classified as Culturally Proficient.

E-clinical networks. Clinical networks are defined as "linked groups of health professionals and organizations from primary, secondary, and tertiary care, working in a coordinated manner, unconstrained by existing professional (and organizational) boundaries to ensure equitable provision of high-quality and clinically effective services" (Edwards, 2002, p. 63). An E-clinical network digitally connects health professionals.

Ozmosis is a virtual community of practice of licensed physicians practicing in the United States, designed for the exchange of medical knowledge. Licensed physicians may join *Ozmosis* at no cost and are able to ask clinical questions to other physicians, search for medical information that is aggregated by *Ozmosis'* medical board of advisors, share complex clinical case material, and participate in "Virtual Grand Rounds." Bookmarking, tagging, and assessing via discussions are the core elements of this virtual platform. *OzmosisESP*, a branch of *Ozmosis* specifically created for health care organizations, offers whole organizations the same capability of sharing knowledge and collaboration via social networking. The site is only open to licensed physicians whose qualifications are verified by the *Ozmosis* management team. *Ozmosis* has not received a privacy seal but states its own privacy policy on its Web site. It is an incorporated company and is managed by a team of medical professionals.

Ozmosis rated very high in collaboration potential given that members are able to contribute content, comment on content, and network with each other, thereby creating a virtual community of practice. The primary direction of communication between users is bidirectional. Given that the site does not speak to inequities in health care or language translations, it received a rating of Cultural Incapacity in terms of potential to address health disparities.

E-patient networks. "E-patients" are patients who have access to digital information and use it effectively to engage collaboratively with their clinical providers (Fergurson & The E-Patient Scholars Editorial Team, 2007). An E-patient network connects these patients fostering collaboration, education, and support. *PatientsLikeMe* is "an online community built to support information exchange between patients" (J. H. Frost & Massagli, 2008, p. 215). Patients self-identify and develop a profile based on a set of personal health data to connect with similar patients (J. Frost & Massagli, 2009). After becoming members (at no cost), users create a profile, with demographic information and their health conditions. Members can store and track personal data over time. The site is open for caregivers to connect and share experiences. Additionally, aggregated data can be made available to industry and research entities with the hope of improving patient care. A management team and a board of directors manage *PatientsLikeMe*. The social networking site has several partners in the industry, nonprofit, research, and academia sectors. *PatientsLikeMe* is financially sustained through the sharing of patient data with these partners, specifically involving experiences with products. Participants are patients who are willing to give up a certain amount of privacy as they engage with an e-health tool that it is also supported by private for profit companies. Questions of privacy and commercial interests may limit the ability of this e-health tool to engage a large segment of patients who may be reluctant to make their health information publicly available.

In terms of collaboration potential, we rated *PatientsLikeMe* as very high given that it provides users with a platform to interact and shape experience. The primary direction of communication is bidirectional as users are able to directly interact with each other. *PatientsLikeMe* has HON certification and additionally lists its own privacy policy on its Web site. However, *PatientsLikeMe* also distinguishes itself through

its "Openness Philosophy," which promotes the sharing of patient data for research purposes. *PatientsLikeMe* has the potential to address lack of health care access and quality given its emphasis on patient empowerment and participation. Moreover, it stimulates the participation of family caregivers as it encourages networking among them too.

E-patient + E-provider networks. E-Patient + E-provider networks combine the elements of a E-patient network (see below) with the addition of the participation of health care professionals via moderation of forums, posting information for comment, or responding to user questions. *HealthCentral* is designed for users to research health conditions, connect with others experiencing similar illnesses and with clinical experts who respond to questions. Registered *HealthCentral* members can save and share articles and blogs. The applications that are available include a symptom checklist, tests to measure stress level, sleep patterns, and body fat, and calculate calorie consumption, BMI, and cholesterol level. Information about medication and healthy recipes are also available. *HealthCentral* is owned and managed by a for-profit business, and HON and Truste have certified it.

The primary direction of communication is bidirectional and the potential for collaboration potential is high as the members are able to share stories, make comments, and ask questions of both other users and health care professionals. Visual representations of underrepresented minority patients may indicate a recognition and attention to diversity. Based on our criteria, *HealthCentral* received a rating of Pre-Cultural Competence on its potential to address health disparities.

Health research networks. Health research networks are similar to E-clinical networks except they solely digitally connect health researchers rather than all health professionals, allowing these researchers to collaborate and quickly access each other's research findings. *BioMedExperts* is a social networking site designed for biomedical researchers to share published information. Using the *PubMed* database, user profiles are prepopulated based on their publications and connections with coauthors with whom they have published (Whitaker & Shokrollahi, 2009). User identities and publications are verified via the *PubMed*

through the prepopulation process. Only publications included in the *PubMed* are listed. Publication is not required to join the free network. Users are able to graphically view their network, search for researchers, and see the research activity of members. *BioMedExperts* is owned and managed by one of the largest academic publishing companies (Elsevier Inc.). *BioMedExperts* articulates its own privacy policy on its Web site.

The primary direction of communication is bidirectional given that members are able to exchange messages with each other. Given that *BioMedExperts* solely serves as a tool for researchers in the biomedical field to network and communicate, it received a rating of low on collaboration potential. *BioMedExperts* received a rating of Cultural Blindness given that it does not intend to focus on underserved populations. However, it is not U.S.-centric as users are able to connect and view research connections of researchers in other countries. Recent publications and coauthors are not quickly updated to profiles, which is one concern regarding reliability.

Public health and prevention. Public health and prevention comprise tools designed to enhance the health status of the population and prevent the emergence of disease. Thus, e-health tools included in the public health and prevention category seek to digitally meet the aforementioned goal. *Txt4Baby* was designed to support mothers in caring for themselves during pregnancy and their newborns for one year after birth. The intervention consists of delivering approximately three "text-length messages" per week that convey relevant health information and resources. Users may register online or via cell phone at no cost by texting the word "BABY" or "BEBE" (for Spanish) to a U.S. number. The Healthy Mothers, Healthy Babies Coalition in partnership with several founding partners, including Johnson and Johnson, Voxiva, Inc., CTIA – The Wireless Foundation, and Gray Health care Group, launched *Txt4Baby*. Several governmental departments also partner with the Healthy Mothers, Healthy Babies Coalition to support *Txt4Baby*. It is primarily managed by the Healthy Mothers, Healthy Babies Coalition, and text messages are developed by the Healthy Mothers, Healthy Babies Coalition. *Txt4Baby* does not have a pri-

vacy seal but lists its own privacy policy on its Web site.

The primary direction of communication is unidirectional as the primary purpose of the tool is to deliver text message information to users in an easily accessible manner. However, we rated *Txt4Baby* as highly collaborative and focusing on reducing health disparities. Research (Whitford et al., 2012) seems to also demonstrate this tendency. The core of this program is for users to receive "scientifically accurate" information from health professionals. Collaboration between users and creators and partners and creators include sending suggestions about message content. Additionally, *TxT4Baby* invites external organizations to become "outreach partners" and promote the service. *Txt4Baby* received a rating of high in terms of collaboration potential. *Txt4Baby* is offered in more than one language and is accessible to underserved populations as it is free and information is delivered via mobile phone. Furthermore, it was designed with the purpose of reaching underserved populations. *Txt4Baby* received a rating of Culturally Proficient and may serve as an e-health model to imitate in terms of its potential to address health disparities.

Self-tracking. Self-tracking is not a new phenomena; patients have self-monitored their body activity for decades (i.e., diabetes patients). With the advent of health informatics, however, the phenomenon has grown exponentially (Wiederhold, 2012). Innovation in this area continues to grow and many products for different chronic illness conditions are available. One example is *Zeo Sleep Manager Mobile,* a mobile phone application that allows users to monitor their sleep patterns by using a sensor headband that tracks sleep stages and wirelessly sends them to a smartphone. Some studies have shown that *Zeo* is "an easy to use and accurate complement to other established technologies for measuring sleep in healthy adults" (Shambroom, Fabregas, & Johnston, 2012, p. 221). An incorporated company produces *Zeo*. It displays both the McAfee Secure and eTruste on its Web site.

Zeo is designed for patients to better manage their own sleep patterns. This self-quantified tracking tool helps users to record the amount of time they spend in various stages of sleep each night. The application also offers an alarm clock that gently wakes users "at the optimal point in the sleep cycle." Additionally, users can access online tools and an expert coaching program to help assess their sleep cycles. The primary direction of communication is unidirectional given that the primary purpose of the tool is for users to monitor and track their sleep patterns, without necessarily sharing this information with others. However, users are able to connect with others through an online support forum, as well ask questions to experts. *Zeo* received a high rating in terms of collaboration potential given that users are able to interact with both health care professionals and others users to ask questions. In terms of potential to address health disparities, *Zeo* requires purchase by the user and unless health insurance covers it, it will be inaccessible to underserved populations.

E-care practices. In E-care practices, doctors are accessible for consultation by their patients. The design of these virtual practices is combined with offline regular care while health information technology is intensively used to ensure affordable and high quality care. Hawaii Medical Service Association (HMSA) Online offers Hawaii residents, not just HMSA members, immediate communication with participating physicians online—a primary care provider or specialists in a secure synchronic tool that include text chat, Web videoconferencing, and phone. Users are able to consult with a physician or specialist about health concerns and obtain medication prescriptions from anywhere with access to a computer or phone at cost to the user. Doctors assisting patients do have access to the patients' electronic medical records. A written report is prepared based on the documentation that is created during the consult and sent to the primary care physician to coordinate care. Given that users are communicating with licensed physicians and specialists and that information is managed by a licensed insurance company, the consultation information follows HIPPA regulations. HMSA online does not list a privacy certification seal but does state its own privacy policy on its Web site.

The primary direction of communication is bidirectional given that dialogue between users and health care providers drive the purpose of the HMSA online. Users are able to communicate with health care providers directly and are given the opportunity to provide feedback on their experience with the provider once the ses-

sion has ended. Given the sophisticated level of interaction between users, online providers, and primary care physicians, HMSA rates very high in collaboration potential. HMSA online received a rating of Culturally Proficient given its wide accessibility, or availability, to Hawaiian residents and in committing, as described in its Web site, to provide health care to people regardless of whether they have insurance coverage and regardless of age, gender, and ethnicity.

Discussion

E-health tools are often designed and aimed at patients who have better digital and health care access and not deliberately built to reach the most vulnerable populations. As a result, the development of e-health tools may maintain or even widen health care inequity. Our review of the tools supports this hypothesis. However, to assess the tools for their ability to enhance collaboration and counteract health disparities is a complex task that will require more than our preliminary observations.

The criteria to evaluate what we consider culturally competent are contested; the case of e-health adds another layer of complexity. However, several overt dimensions in the design and purpose of a tool have potential impact on augmenting or reducing disparities. The managers of the tools can control what broadband access is required, whether the platform is interoperable, whether the site has translation capabilities and has an appropriate level literacy, whether the site follows universal design principles, and whether the health care information is reliable.

The reach of e-health continues to grow, and it can be expected that new types of social technologies that were not found in our analysis will emerge. Given the expected growth of e-health and the widespread use of mobile technology and the Internet, both patients and health care providers are presented with a unique opportunity for participating in patient health management. E-health tools may open the window to more preventative rather than reactive health care as patients and health care providers have the ability to communicate beyond the doctor's office and in real time. Furthermore, e-health tools offer the possibility of bridging the divide in health care service as health providers can overcome the barriers of reaching

underserved populations, such as transportation. In light of increased usage of digital technologies among patients of color, the implementation of social technologies strategies in health care should be part of a sound collaborative health strategy. However, for e-health tools to actually address health disparities, creators of e-health tools must consider the needs of underserved populations and ways in which they are already using social media.

Patients, their families, and clinicians are becoming much more sophisticated in adapting social technologies to health care activities than the speed at which research in this area develops and therefore what would count as evidence based practices in this area. Furthermore, market forces might impinge on the ability of practitioners and patients to incorporate more reliable tools into the collaborative health environment. It seems that the business of digital technology determines the evolution and longevity of the e-health tools. The changes (interface, ownership, features, login requirements) in e-health tools are remotely related to the demands of collaborative health but closely linked to market forces.

A limitation of our study is the difficulty at establishing which tools to analyze or what our "population" was. E-health tools were evolving as we were completing the research. Applications and its capabilities were continuously added or deleted. Consequently, the classifications changed—what might have started as a static webpage, for instance, became a sophisticated networking tool. This limitation, however, highlights a main finding or a core characteristic of the subject under study. The sample, therefore, may have not been comprehensive and could not be the most representative of a particular category. This is a result of the lack of analytical tools that systematically evaluate digital tools and social media tools with standardized criteria. The available analytical tools that measure traffic, reputation, return on investment (ROI) and other variables were designed under the logic of marketing principles rather than social sciences or health care research data analysis assumptions. Other variables that social media metrics would need to consider and that are particularly significant in health care include viability, scalability, and sustainability. An additional consideration for future research, a dimension not covered in the

scope of this article, is that of accessibility in relation to people with disabilities.

Conclusion

Accessibility to ICT is a powerful factor—one not to be taken for granted—in resource-scarce environments. With the combination of a collaborative health approach and the emerging social technologies potential, we could be better prepared to challenge the financial, geographical, and logistical barriers that exist in creating a context for ongoing interaction, collaborative learning, fast access to information, and transparency. Social technologies in health care, therefore, have the potential to address perennial health care quality and access inequities.

New technologies appear at an accelerated rate, and it seems logical to predict their potential for addressing access and quality issues related to the active participation of patients in their care, and the health care system's ability to effectively reach more patients. These emerging technologies could, therefore, foster empowered patients. Innovation per se, however, is not enough. This is especially relevant in the case of low-income segments of the population, racial and ethnic minority populations, English language learners, those with low levels of health literacy, and other vulnerable populations. In light of the digital access and literacy divide, the developers of these tools must focus on the amelioration of disparities in health care. Otherwise, the risk of deepening these disparities is inevitable. To access patients from disenfranchised communities, a combination of offline and online tools is necessary, together with a seamless integration of both including "traditional" technologies like phone and printed mail. The virtualization of care will need to be one part of the continuum of health care. Assessing for cultural competency may not yet, therefore, be mostly about the virtual instrument but how it is integrated in the continuum of care. The digital divide in e-health is a serious barrier and a contributor to health disparities (M. C. Gibbons et al., 2011; M. C. Gibbons, 2007). If e-health were about reducing health care inequity, we would need to measure to what extent it is part of a strategy that focuses on access and quality for those who are left behind in the race for health care innovation.

However, the digital divide is not dictated solely by economic access to social media tools or lack of health literacy on the part of patients, but also by the choices that health care systems make. The tools that may have been adopted by early adopters, for instance, may pose difficulties to underserved and vulnerable populations. Innovators do not seem to first include these populations in participating in the design of tools, or even investigate what tools these patients are already using and can possibly easily access. Furthermore, consideration of the health issues faced by vulnerable populations as well as the cultural contexts in which they live is critical in developing digital tools that aim to reduce health care disparities. Culturally competent evaluation of e-health innovations, therefore, should include social determinants of health in determining which e-health tools health care providers should use. In examining social media that may impact health care, we aimed at developing criteria to evaluate, which tools and processes to design, implement, and sustain to strengthen a collaborative family health care practice that also, advances health care equity.

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