Recommendations for the design, implementation and evaluation of social support in online communities, networks, and groups

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A new model of health care is emerging in which individuals can take charge of their health by connecting to online communities and social networks for personalized support and collective knowledge. Web 2.0 technologies expand the traditional notion of online support groups into a broad and evolving range of informational, emotional, as well as community-based concepts of support. In order to apply these technologies to patient-centered care, it is necessary to incorporate more inclusive conceptual frameworks of social support and community-based research methodologies. This paper introduces a conceptualization of online social support, reviews current challenges in online support research, and outlines six recommendations for the design, evaluation, and implementation of social support in online communities, networks, and groups. The six recommendations are illustrated by CanConnect, an online community for cancer survivors in middle Tennessee. These recommendations address the interdependencies between online and real-world support and emphasize an inclusive framework of interpersonal and community-based support. The applications of these six recommendations are illustrated through a discussion of online support for cancer survivors.

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1. Introduction

The field of biomedical informatics is undergoing a major transformation in the design of personal health information systems. Social networking technologies are changing the ways that individuals manage their interpersonal and community relationships throughout all aspects of their lives. A new model of health care is emerging in which individuals can take charge of their health by connecting to online communities for personalized support and collective knowledge [1,2]. These systems are social in nature and emphasize communication and collaboration among groups and individuals. The increasingly social functions of web-based technologies and their increasing use suggest that online social support for patients and families will be an essential component of a comprehensive approach to health care. However, in order to take advantage of this opportunity safely and effectively, biomedical informaticians must incorporate a more inclusive conceptual framework of social support and community-based research methodologies into the design of new systems to address the potential roles and impacts of social networking.

No gold standard currently exists for the design of informatics-based social support interventions, although there have been some efforts at systematic description of studies [3–6]. Studies of existing health-related virtual communities and online support groups emphasize perceived social support as an outcome, but research has failed to demonstrate a consistent significant effect of these systems on measures of social support [7–10]. These results may be due to the use of evaluation tools that do not appropriately target the unique forms of support that occur in online environments [11,12]. The concept of social support is historically and operationally complex, with many different definitions and dimensions identified in the social science literature [13]. The seminal studies of online support in informatics research typically focused only on a more narrow definition of emotional and informational support [3,11,14]. Researchers must target the types of support that occur in the online intervention, and this may be broader than what traditionally has been measured.

In light of the current trends towards patient-centered information systems, it is essential that informatics researchers and developers revisit the fundamental conceptualizations of online social support and how these concepts inform the design and evaluation of online support interventions. Coiera has called for a greater
Six recommendations for the design, implementation, and evaluation of online support interventions.

Although not focusing specifically on health-related support groups, Kraut and his colleagues have been advocates in using social psychological theories and research to inform design of online communities [17] and they also highlight the challenges of doing so [18]. They used these theories to make recommendations on the design of systems and how to engage participants. Similarly, we used ecological systems theory and principles of community-based participatory research (CBPR) to develop a framework of six recommendations to guide future design of online interventions for social support in healthcare. The six recommendations framework emphasizes community-wide conceptualizations of support, and the interdependencies between online and real-world social relationships. These recommendations will be explained along with examples of their application to support for cancer survivors. The uniqueness of these recommendations is that they draw on relevant theories that have not been systematically or explicitly incorporated into online interventions and that they address the full life-cycle of the interventions: design, implementation, and evaluation of online support interventions (Table 1).

To begin our quest for the most effective design for a social networking system we conducted a narrative literature review. Search terms included “participatory research” “cancer support” “social support” “social capital” “sense of community” and “online communities.” Databases included Medline and Google Scholar. Iterative searching based on review of references and MeSH terms from relevant articles was conducted.

We expanded on the information from the literature review with extensive community based participatory research with cancer survivors, their families and cancer based organizations. The CBPR was designed to discover what was important to the greater cancer community. This subsequent work of the authors consisted of individual interviews, modified Delphi needs gathering sessions and iterative design and review sessions with the community. Both the needs gathering and the review sessions used the nominal group process method to arrive at consensus about what would be most useful to the community. In turn this research translated into clarification of the final six recommendations.

The views expressed in this paper are based on a narrative review of the social support, biomedical informatics, social networking, and community psychology literatures, as well as the authors’ work in using CBPR with cancer survivors, their families and organization to discover what online support for cancer survivors would be the most helpful. The recommendations presented in this article evolved after the narrative literature review and the subsequent work of the authors.

### 2. Background

#### 2.1. Conceptual frameworks of support and ecological systems theory

The concept of social support includes a range of support processes and structures in social relationships that impact health and well-being in multiple ways [19]. Social support processes refer to the “functional nature or quality of social relationships” and behavioral and cognitive interpersonal interactions [20], while support structures refer to structural characteristics of an individual’s social networks and the overall bonds of a community. Conceptual frameworks of support include, but are not limited to, perceived social support (emotional support, informational support, instrumental support, and appraisal support) [21,22], unsupportive social interactions [23], social integration [24], social network structure [22], and social capital. Social capital is a concept from the social sciences that includes constructs such as sense of community, collective efficacy/empowerment, and citizen participation [25]. In order to design and evaluate online support systems, it is important to recognize and address these complexities of social support.

Ecological systems theory [26] provides an overarching framework for research to address the broad range of support concepts. This theory emphasizes that social relationships include a range of interdependent social contexts, including psychological characteristics, interpersonal relationships, neighborhood, organizations, community, public policy, the physical environment, and culture [27]. The broad, ecological perspective guides a more complete understanding of the roles and impacts of social support in both real-world and online environments. Ecological systems theory influences the types of research questions asked, methodology used, and outcomes measured in studies of social support and well-being. For example, community-based participatory research (CBPR) is a collaborative approach to health intervention research that typically employs an ecological framework of the community [28–30]. While popular in other applied social sciences, biomedical informatics approaches have not typically been developed, used, or evaluated using CBPR models.

#### 2.2. Current challenges for online social support research

Social support research often includes community-wide assessments, but the focus of the research literature in online support primarily emphasizes the interpersonal processes of emotional and informational support and has paid less attention to concepts such as social network structure and social capital [31]. Yet, it is these structural and community-wide concepts of support that may be especially relevant for the networks and communities in emerging online social networking environments [32]. For example, scales of perceived social support validated in real-world contexts [3] may not accurately measure the impact of online support because the survey questions do not address the unique social interactions and structures that occur in web-based groups and communities [33].

The lack of appropriate measures for the broad concepts of online social support is a barrier to conducting controlled trials that evaluate the impact of online support interventions. Informatics researchers will need to use adapted and new measures, methodologies, and principles for the effective design and evaluation of online social support systems.

Research that focuses only on enhancing individual coping skills and perceived social support also may overlook potential impacts

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on community support, such as public policies and the availability of financial assistance [20]. Only a few studies in the online support literature have addressed measures of social capital or its subcomponents [34]. In addition to interpersonal measures of support and measures of individual characteristics [35], research in online social support will be better informed by including measures of some of the components of support structures such as social capital. This approach applies to all stages of design, implementation, and evaluation of such systems and can be guided by models of community-based participatory research (CBPR).

The iterative, participatory, and action-oriented characteristics of CBPR fit well with the cyclical processes and principles of patient-centered, participatory design for information systems [36]. Elements of these participatory principles, such as a shared sense of ownership, can be seen in research on the implementation of clinical information systems in health care organizations [37,38]. In summary, a major challenge for research in online social support is that the concept of social support is multifaceted, but much of the research on online social support focuses on only a small part of the picture.

3. Future research for online support interventions

There is a correlation between well-being and support from an individual’s own social networks, but both online and real-world interventions primarily focus on support from strangers, such as peer support groups, with relatively weak results [3,39–44]. Cohen suggests two directions for the design of real-world social support interventions [39]. First, interventions can target an individual’s existing social networks, in which changes can produce more long-term support. Secondly, interventions can target various levels in the social environment. These approaches can include strengthening the individual’s intimate and extended ties, teaching the social skills needed to utilize these relationships, increasing social integration in the community, and reducing negative interactions [39].

While peer discussion and the use of clinical experts are recognized as important components of online support interventions [45], only a few studies have addressed the role of real-world social ties in online support networks, and vice versa [46,47]. Over 15 years ago, Kraut and his colleagues, although not specifically looking at online health support groups, studied the impact of extensive use of the Internet on real-world social relationships and found negative effects [48]. They advocated attending to the real-world social support networks and developing methods within the online communities to take advantage of the real-world social networks [48]. More recently there have been models of online support that stress the role of family and friend relationships that help patients manage their health and personal health information [49–51]. A few research and commercial initiatives are beginning to provide communication tools that integrate a patient’s various support relationships, from clinicians and peers to family and friends [52,53]. Involvement of multiple interpersonal and community relationships can influence the overall impact of the online intervention. For example, one study found that participants in an online support group for hearing loss benefited more when their family and friends also participated in the online group [46].

Many online groups and communities are based on shared interests or identity (e.g., cancer support groups), but online communities also can be designed as extensions of geographic, real-world communities [54,55]. Online social support may have the most impact in physical communities in which the Internet-based interactions are connected to face-to-face interactions [56]. Development strategies for geographically-based community networks [54] may offer valuable lessons for including real-world relationships in online support systems. Likewise, community-based participatory research methodologies may guide informatics researchers to appropriately partner with community members throughout all aspects of the research process.

Future informatics research needs to employ a holistic approach to outcome measures that includes assessment of support at various levels of a patient’s social networks and community including both online and real-world relationships.

4. Application of the six recommendations for online support to cancer survivorship

The six recommendations outlined in Table 1 guide directions for the design, implementation, and evaluation of online support systems. The first three recommendations target informatics system design and implementation, while recommendations four and five focus on system evaluation. The sixth recommendation highlights the cyclical, iterative nature of design, implementation and evaluation throughout the process of community-based informatics research.

The authors’ research in developing and evaluating CanConnect, an online community for cancer survivorship in middle Tennessee, used ecological systems theory and CBPR principles to guide the informatics research design [57]. Grounded in the development of collaborative partnerships among local community members and organizations, this work illustrates the value of moving beyond patient-centered design to a more relationship-centered [49] and community-centered design. CanConnect’s mission is to bring together local cancer survivors and community partners through a shared vision and innovative online collaboration. CanConnect currently covers the middle Tennessee/greater Nashville community. Its goals include: (1) connecting cancer patients, survivors, and any individuals who are touched by cancer through personal shared stories, experiences, and wisdom; (2) increasing awareness and participation in cancer-related events, news, resources, and programs through a community-driven network; (3) producing multimedia content (video, articles, etc.) that highlights the people and programs in our local community; and (4) connecting partners in health-care and community organizations to collaborate and share strategies and knowledge.

We will illustrate how each recommendation can be applied in practice by discussing them in the context of improving support for cancer survivors and illustrating them with case examples from CanConnect. These recommendations are not unique to cancer survivors and could be applied in designing other support groups for patients with chronic illness, although it is likely that there will be differences in their applicability in some cases, depending on the unique characteristics of the group.

4.1. Address the interdependence between online support and real-world support

Recognizing the role that online communication can play in real-world interactions [47], and vice versa, can lead to new interfaces and approaches to social support interventions. Cancer survivors have a demonstrated need for re-establishing their real-world, social ties that have been lost or reduced following the completion of treatment [58,59]. Informatics applications can be designed to reduce social isolation and increase one’s sense of control over real-world social re-engagement. Re-integration in social settings, such as finding a new job, can require the use of larger, loosely connected networks [60]. System developers can address these practical needs of cancer survivors through online social networking interfaces with the intention of impacting real-world relationships. Facilitating employment, volunteering, and advocacy opportunities
are all examples of how online networking can blend with cancer survivors' real-world interactions.

Just as technology has the potential to impact real-world social relationships, the social environment also can affect the manner in which the technology is used [16]. By including members of the support network, patient-centric information systems will require new approaches and technological frameworks for privacy in sharing personal health information [61]. Psychosocial support for cancer survivors may already occur in real-world relationships and programs [62], and this real-world support should be addressed in the design of consumer informatics systems to achieve effective closed-loop care of these individuals.

4.1.1. Case example

CanConnect explicitly included a community calendar that included meetings of local support groups and other events of interest to the cancer survivorship community. In addition, a display of local support resources through an integrated Google Maps interface provided a visual, geographic representation of the cancer survivor’s local support environment. The use of these online tools facilitates awareness and participation in real world support activities beyond online only communication.

4.2. Address the individual’s existing social networks (e.g. family, friends, and co-workers)

Social support in existing social networks has shown positive effects on health, and negative support in social networks is associated with a negative effect on health [43]. Informatics interventions should improve support in an individual’s existing social networks and also seek to reduce negative interactions in these relationships. Patients, health-care providers, family, friends, co-workers, neighbors, and others all can be included in the design of an online support system. This recommendation differs from the first recommendation in that an individual's existing social networks may exist primarily in the real-world, primarily online, or a combination of both. Research has indicated that the online community can enhance, but not replace, the real-world social network [63].

Cancer survivors continue to have high informational support needs [64] and in addition benefit from instrumental support provided by family and friends who cook meals, run errands, and offer financial assistance [65]. Most research on the design of online support systems has not targeted social support from cancer survivors’ existing social networks of family and friends. Several online services allow patients to share online journals with their social networks, but most informatics research on cancer survivorship has not included technologies to facilitate the emotional presence of family and friends [55,66,67]. Researchers are beginning to explore how online social networking frameworks that connect an individual’s existing social relationships, such as Facebook [68] and Twitter [69], can enhance the support of cancer survivors [70,71].

When designing online support systems for cancer survivors’ existing social networks, informatics researchers also must consider the amount and type of interactions that will provide optimal support. Although the right amount of information can be helpful, family and friends often inundate cancer survivors with too much information, undesired advice, or too much attention [21,36,72–74]. When carefully designed, interventions can support cancer survivors with a focus on family and friends to dispel myths, improve communication, and facilitate the expression of needs and feelings [16]. Following the lead of peer support groups, online environments designed expressly for networks of family and friends can be created to foster open communication. Some advantages associated with online cancer support groups include increasing self-disclosure, decreasing misconceptions, and increasing honesty [45,75,76]. Online networks for family and friends may require novel interface designs that facilitate specific types of self-disclosure and education appropriate for cancer survivors and their social networks.

4.2.1. Case example

CanConnect was not limited to only cancer survivors and health professionals. Family and other support roles were also welcomed and encouraged to participate in both the design process and as online members. In addition, CanConnect had accounts on Facebook, Twitter, and YouTube to integrate CanConnect resource content with participants’ existing online networks. For example, events posted on CanConnect were also posted on CanConnect’s Twitter profile so that users could follow local support opportunities through their personal social networking workflow.

4.3. Target community-wide outcomes and participation of local community groups

In addition to each individual’s social networks, local community groups and health-care organizations can be included in web-based systems and interfaces. Established and respected community-based programs can play a key role as partners or facilitators in online support systems. A social network can improve interactions among local community members and can lead to new frameworks that easily connect the person with the health care organization and the community [77].

Informatics applications can target the broader levels of community process and structures, informed by an ecological model of the community [78]. A report by the Institute of Medicine highlights the need to improve cancer patients’ and providers’ awareness of community support programs and services [79].

The design process for online support programs should include active partnerships and collaboration with community organizations and services. In this way, the existing community-based psychosocial programs can be integrated with the online support intervention. If efforts are made to include the community in the design process, new informatics frameworks have the potential to create awareness and facilitate referrals to these community resources [80,57]. Community resources include local support groups, transportation and financial programs, patient advocacy opportunities, and other social services. Influential community organizations and leaders, such as church groups [81], also may be included in online interventions for cancer survivors. A few research studies are beginning to address the role of online collaboration tools in regional cancer coalitions and professional networks [82], as well as in other community health contexts [83].

4.3.1. Case example

CanConnect design partners included cancer centers/hospitals, cancer non-profits (for support, advocacy, and prevention), the state cancer coalition, regional affiliates of national non-profits, and cancer-type-specific organizations. The types of the individual participants included an oncologist; patient education coordinator; survivorship researcher; social worker; non-profit executive director/program coordinator; cancer survivor advocate; advocacy program manager; cancer center outreach coordinator; cancer center community education director; cancer disparities expert/director; state coalition staff; cancer center web master; support group leader; and oncology nurse. In addition, the partnership was reciprocal. Not only did these organizations participate in the design of CanConnect, but CanConnect and the research team also created awareness and provided support for the participants’ own existing efforts. For patients, CanConnect was a resource for information about community events, health information, tips and success
stories from other patients. There was a mechanism for review of the information by project staff. CanConnect also included opportunities for collaboration among local organization representatives (such as a private discussion forum for professional health care users and access to the shared community calendar). As illustrated in the previous examples, CanConnect focused on building awareness of community-wide programs and initiatives, beyond traditional peer support, such as fundraising events, exercise programs, and other social and educational events.

4.4. Adapt and/or develop evaluation measures for support specific to online environments

In order to effectively measure the impact of support in online environments, new or adapted measures specifically targeting the unique components of online interactions must be developed. The evaluation of online social support can be improved by better understanding of the similarities and differences between online and real-world social support. For instance, a study of an online cancer listserv found that patients participating in the listserv more frequently only when their real-world support was perceived to be low [84]. Research is needed to understand how online communities provide a unique form of support compared to real-world communities, and what aspects of the virtual environment actually influence the patients' perceived support. Future research should adapt existing measures of social support and/or develop new measures that are more sensitive to online environments. Participation in online support groups should be evaluated in terms of its impact on both online and real-world social support.

Evaluations of complex online support interventions for cancer survivors should distinguish the systems' different core components and their individual roles in health outcomes [56]. For example, the perceived presence and emotional support of “being there” [75] likely are expressed in unique ways through emerging web-based interfaces [85] such as friend lists, visit logs, and multimedia displays. Knowing how many people have visited one’s personal online journal or web page may be important to cancer patients [52], but this type of support is not targeted adequately in existing evaluation scales.

4.4.1. Case example

The authors recognized the challenges and limitations of applying evaluation tools that do not specifically address online and cancer survivor environments or that were not specifically targeting sense of community. Formative evaluation of CanConnect included focus groups, individual interviews, and surveys that specifically addressed the psychological sense of community. The formative evaluation data was used as part of the iterative design of the system.

4.5. Consider all units of analysis (from interpersonal to community-wide measures of support)

As social networking sites become more popular for online communication, it is important to evaluate the social networking processes and structures from a focus on the individual up to and including the community. When the online social network system is designed to impact community-based support, then the intervention must be evaluated in terms of the relevant community outcomes.

Evaluation research in cancer survivorship has focused primarily on individual-centric outcomes of social support, quality of life, and both mental and physical well-being, with less attention paid to community-level outcomes. The impact of engaging existing community-based support organizations and health-care institutions in online environments is not well understood. Evaluation of online support groups and online social networking interventions for cancer survivors needs to target community-wide change.

An example of community-wide emotional support can be found in the “Hugs for Jacey Campaign” on the YouTube video sharing community [86]. In this case, a YouTube member created a public video for another YouTube member whose child had undergone treatment for cancer. The Hugs for Jacey Campaign author created a video in which she called for the entire YouTube community to give virtual video hugs to the child. This creative and unique form of support represents the emerging ways in which emotional support may evolve in online communities, and future evaluation tools for social support should take these behaviors into account.

Online support may affect cancer survivors' quality of life through changes in community policies and access to supportive care resources. The social capital component of collective efficacy/empowerment [25] may be especially relevant in evaluating online support interventions for cancer survivors and communities. On a local level, members of a geographically-based online network can communicate online to effect changes in key neighborhood policies [60]. Cancer survivors can use online support groups to coordinate efforts to change real-world, local policies. One example is an online group of breast cancer patients who together decided to request a different and less painful procedure for their post-operation mammograms [87]. Cancer patient advocates work with researchers to support patients' interests in the design of research studies [88], and online collaboration tools may help facilitate these partnerships. As informatics interventions are developed to support these interactions, research will be needed to evaluate how collective efficacy and participation in online initiatives directly or indirectly impacts the well-being of cancer survivors by improving policies at local and national levels.

4.5.1. Case example

Most evaluations of cancer support groups have focused on interpersonal support. The steering committee's goals for CanConnect were much broader than that, and the formative evaluation of CanConnect, as stated above, focused on the building of a city-wide collaboration, awareness of local resources and support programs, and sense of community measures. Although a formal summative evaluation was beyond the scope of the initial project, the final design and the support site itself was approved by the steering committee as meeting their goals.

4.6. Employ ecological systems theory and principles of community-based participatory research

Grounded in ecological-systems theory [89,26], an integrated intervention that includes personalized education, family and friends, peer patient groups, and community networks may have a greater impact on well-being than each individual component alone. Facilitating support across multiple levels of the community suggests the use of community-based participatory research (CBPR) for iterative system development and evaluation. Online support research should incorporate participatory principles of CBPR, such as building on the community's strengths and promoting co-learning by both researchers and community members. CBPR also emphasizes the continuous evaluation of the collaborative process throughout the development of an intervention. Qualitative and quantitative [90] evaluation of the participatory design process will help to establish principles and best practices for the development of community-based systems for online support.

Community-based research principles have been applied in the development and evaluation of real-world cancer prevention and support initiatives [88]. Cancer is a natural fit for community-based research because of the strong sense of identity among
cancer survivors [91] and the many community-based organizations that support cancer survivors. Grant funding for community-based participatory research (CBPR) for cancer survivorship has been available to support investigators and community programs in doing this work [92]. Informatics researchers can use these examples and opportunities to study online support for cancer survivors in their communities.

4.6.1. Case example

The evaluation for CanConnect focused on an ethnographic and qualitative evaluation of the local cancer support community and the iterative design process. CBPR principles and methodology guided all phases of the iterative and participatory research and design process. In particular the principles that guided the participatory approach in this study, drawn from principles summarized by Israel et al. [29] and O’Fallon and Deary [93] are:

1. Define community as a unit of identity.
2. Ensure projects are community-driven: promotes active collaboration and participation at every stage of research.
3. Foster co-learning.
4. Build on strengths and resources within the community.

An ecological framework was applied throughout the process in terms of specific design functionality. Rather than evaluating support only in terms of interpersonal social support, this framework suggests that interpersonal support should be considered in a broader context of the individual’s coping strategies and community-wide aspects of support [26,27]. For example, as we described above, a wide range of the cancer survivorship community were included as participants, such as cancer survivors, family and friends, clinicians, community support professionals, and researchers. This approach to triangulation followed the ecological-systems theory framework by targeting various ecological levels of the community. We also broadened our focus beyond the individual by addressing regional cultural issues. In middle Tennessee, located in the southeastern United States, aspects of this culture include country music, rodeos, and hunting. Cancer support and awareness groups and events were identified in the local community in each of these areas of interest.

5. Conclusion

Social support is a complex concept with a range of interpersonal processes and community structures that can be applied to the study of online support systems. Six recommendations for the design, implementation and evaluation of online support are provided to guide developers of informatics-based systems to target the interdependence between online support and real-world support. New and adapted measures of support will be essential to effectively evaluate the impact of online support interventions. Established community-based participatory research principles and methodologies can guide the informatics research design. This approach will require a paradigm shift beyond patient-centered interventions to informatics interventions that empower communities and social networks.

A discussion of research on social support for cancer survivors illustrates the application of the six proposed recommendations. These recommendations for online support for cancer survivorship may serve as a model for new directions in other areas of health and wellness. Future research studies in online support should evaluate the application of these recommendations to other domains. We consider research in these directions significant for the evaluation of existing online support systems, and especially for the development of new online communities and web-based applications. As the social capabilities of the Internet continue to grow, research in online support must stay informed of the broad and evolving conceptualizations of support in social relationships.

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