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Disenfranchised Patients: A Network Analysis of IS Integration in the Context of Patient-Centered Care

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ABSTRACT
Healthcare reform has emphasized coordinated and integrated care — patient-centered care — for a decade. To that end, policymakers have invested in integration of healthcare providers’ information flows. Research to date has studied healthcare actors’ information needs but overlooked communicative exchanges among all participants in coordinating treatment plan decisions. Consequently, while medical literature asserts that patients should depend on information from healthcare providers to enable patients’ participation in treatment plan decisions, the assertion has not been tested. To ameliorate this oversight, we conducted an empirical study of a patient-centered healthcare environment. Our study draws on dependency network diagramming (DND) and social network analysis (SNA) to elucidate the nature and structure of actors’ communications in support of their information dependencies. The findings illustrate that although patients are well supported by personal communications with healthcare providers, they are disenfranchised from the integrated information technology within and between healthcare providers and its potential to support patients’ participation in coordinated “patient-centered care” decisions. Furthermore, knowledge asymmetry between patients and healthcare providers should be considered in the selection and tailoring of healthcare information systems (IS).

Keywords
Patient-centered care, coordination, communication, knowledge asymmetry, information integration, network analysis

INTRODUCTION
Over the past decade, a mantra of healthcare reform has been “patient-centered care” in which patient-specific treatment plan decisions should be coordinated among the pertinent actors—patients and healthcare providers—over patients’ lifecycles (ACP, 2007; Bergeson and Dean, 2006; Porter and Teisberg, 2007; Wagner et al., 1996). A central tenet of patient-centered reform espouses that integrated information systems (IS) should support the coordination of essential information from all pertinent actors. In recognition of the patient-centered care agenda, policymakers have invested in IS to integrate information flow among healthcare providers such as physicians, hospitals, medical laboratories and pharmacies (e.g., Clarke et al., 2003; Davidson and Chismar, 2007; Ellingsen and Obstfelder, 2007; SSHA, 2008). Integrated information flows are essential to coordinating treatment plan decisions over patients’ lifecycles.

The process of serving patients involves diagnosing symptoms, identifying potential treatments, projecting possible health outcomes and deciding on plans of action (D’Cruz, 2008). In the process, providers and patients often face uncertainty for two reasons (Charles et al., 1997; Whitney et al., 2004). Firstly, symptoms are often indicative of numerous and potentially interacting medical conditions that are difficult to distinguish with certainty. Secondly, several alternative treatment options often exist with different possible impacts on patients’ physical and psychological wellbeing and no certain right or wrong answer. Providers and patients seek information, therefore, to help them to overcome uncertainty and decide on plans of action (Ibid.; Daft and Lengel, 1986; Goodhue et al., 1992; Wybo and Goodhue, 1995). However, “while the health care provider possesses better knowledge regarding the expected effectiveness of health care in improving health status, the individual [patient] knows best how improvements in health status affect his or her wellbeing” (Hurley et al., 1992, p. 4). Therefore, to make coordinated patient-centered treatment plan decisions requires the integration of healthcare providers’ technical knowledge and patients’ intimate knowledge of their wellbeing (Charles et al., 1997; Flynn et al., 2006; Gafni et al.,...
1998; Hurley et al., 1992; Von Korff et al., 1997). To that end, “information exchange between patients and health professionals is fundamental to achieving patient participation in decision-making...[which] requires the exchange of all information relevant to decision-making” (Bugge et al., 2006, p. 2065). Because they depend on each other for information essential to treatment plan decisions, patients and healthcare providers can be viewed as a network of interdependent actors.

Prior studies have conceptualized the healthcare system as a network of actors, each of which has specialized knowledge in support of treatment plan decisions (e.g., Ellingsen and Obstfelder, 2007; Hanseth et al., 2006; McGrath, 2002; Ramiller, 2007; Timpka et al., 2007). Specialization is necessary because individual actors are unable to acquire, store and process information in all areas of knowledge (Grant, 1996). Actors lacking resources, such as information related to specialized knowledge, on which they depend to achieve objectives, such as deciding a treatment plan, coalesce into social networks (Borgatti and Cross 2003; Gasson, 2006; Tillquist et al., 2002). Social networks consist of interdependent human actors with links or ties that facilitate coordination, i.e., the exchange of essential resources through interactions. The structure of a knowledge-intensive social network such as a healthcare system is constituted in the patterns of actors’ dependencies and the communicative exchanges they enact to coordinate specialized information. However, prior literature has analyzed the information requirements of healthcare organizations and individual actors without taking into account information exchange constituted through communicative interaction among all actors pertinent to care decisions (e.g., Clarke et al., 2003; Grimson et al., 2000; Huq and Martin, 2006; Keshavjee et al., 2006; Khoumbati et al., 2006; Shakir and Viehland, 2005; van Merode et al., 2004; Xu et al., 2000). To ameliorate this gap, we undertook an empirical study in Ontario, Canada to elucidate the nature of actors’ communications in support of their information dependencies and the consequent structure of the patient-centered healthcare social network.

The context of healthcare for Canadians with diabetes provides a poignant example of patient-centered care that relies on the active participation of patients and numerous healthcare actors in treatment plan decisions. As discussed in this paper, scholars find that active participation of at-risk and diabetic persons can substantially mitigate escalating medical complications and associated treatment costs (Homer et al., 2004; Testa and Simonson, 1998; Wagner et al., 2001) – costs that amounted to CAD $6 billion of the $54 billion Canada spent on all public healthcare in 2000 (PTMH, 2000). However, patients’ active involvement in treatment plan decisions must be informed through communication with healthcare specialists. Such a flow of information among actors within a patient-centered healthcare system has been advocated (e.g., Bergeson and Dean, 2006; Porter and Teisberg, 2007; Wagner et al., 1996) but has not, to our knowledge, been formally assessed.

This paper proceeds as follows. Firstly, we elaborate on the nature of patient-centered healthcare information flow among actors within the context of the chronic condition diabetes mellitus. This provides the basis to draw on social network theory to postulate a hypothesis regarding how actors communicate in support of coordinated treatment plan decisions. We then outline the conceptual framework and methodology adopted to test the stated hypothesis, and follow with an analysis and discussion of findings. The paper closes with implications for researchers and practitioners in the quest to improve information flows in support of patient-centered care.

THEORETICAL FOUNDATION

We use the case of diabetes mellitus health conditions to highlight the significance of information flow among actors in support of coordinated treatment plan decisions. Diabetes mellitus is a chronic condition that tends to amplify medical complications over patients’ lifecycles (D’Cruz, 2008). Patients diagnosed as pre-diabetic (i.e., “at-risk”) bring their risk factors under control through dietary changes, exercise and periodic monitoring of their condition. Undiagnosed diabetics in the population are at severe risk of escalating medical complications because they are unaware of their need to control their blood glucose, blood pressure and cholesterol, for example, to mitigate escalation of diabetes. The diagnostic process involves physicians, nurses and medical lab tests among others. Patients diagnosed with diabetes require regular monitoring, pharmaceuticals such as insulin, and consultations with physicians in an effort to prevent the onset of diabetes-related medical complications such as stroke, heart attack, vision problems and foot disorders (O’Reilly et al., 2007). Patients with escalated diabetes experience diabetes-related organ damage that can lead to escalated medical complications, disabilities and death. Patients’ overarching objective is to manage their diabetic risks and conditions in order to mitigate escalation of medical complications over time.

Escalation of diabetes-related conditions can be substantially mitigated provided that patients implement dietary changes, regular blood glucose monitoring and insulin treatment, for example (ADA, 2003; Homer et al., 2004; Testa and Simonson, 1998; Wagner et al., 2001). Management of diabetes is necessarily patient-centered because substantial segments of the management — diet, exercise, self-monitoring and medication use, for example — rely on the actions of patients over their lifetimes (Bodenheimer et al., 2002; Porter and Teisberg, 2007; Wagner et al., 1996). However, numerous healthcare
providers with specialized knowledge (e.g., physicians, nurses, dieticians, medical laboratory technicians, pharmacists) play a role in informing treatment plan decisions (D’Cruz, 2008). Thus, patient-centered care depends on knowledge held by patients, providers, organizations, the medical community and knowledge about medical resources, processes, metrics used to assess healthcare delivery, and the network of actor relationships (Abidi, 2008).

Actors involved in patient-centered healthcare (i.e., patient and healthcare providers) share their knowledge towards coordinated treatment plans for a specific patient. Within this context, actors communicate with each other to reduce uncertainty, thereby making their decision environments more predictable (Te’eni, 2001). Communication among networked actors supplements information exchange by providing opportunities for clarification and sense-making regarding the potential impacts of alternative treatment strategies for a specific patient (Grabowski and Roberts, 1999). An important aspect of social network theory is the presence or absence of ties that support communication among actors, measured by means of network density and connectivity, and the structure of ties has a direct link with how information is shared (Borgatti and Cross, 2003; Marsden, 1990). Communication and information exchange among the actors benefits from network closure, referring to a dense network in which all actors are cohesively connected to each other (Coleman, 1988). Here, information sharing is leveraged when actors tend to “close” the network by creating and maintaining a dense network of relationships. The closure of the network structure encourages every individual to play an active role in the network and to add to its richness by sharing his or her information (Akgune et al., 2005; Lee and Choi, 2003). The information can be communicated through (1) personal contact (e.g., face-to-face and/or by phone) and/or (2) supporting information systems. Based on the preceding theoretical foundation, within the context of patient-centered health care, we can state the following hypothesis:

**Hypothesis**: Healthcare providers in a patient-centered context maintain direct ties with the patient to communicate information in support of coordinated treatment plan decisions.

Our conceptual framework for assessing the hypothesis is the Abidi (2008) healthcare knowledge management (HKM) services model depicted in Figure 1. The HKM model illustrates that an understanding of information coordination in support of healthcare delivery requires analysis of the stakeholders, the activities they undertake to achieve their healthcare goals (i.e., workflow), the knowledge sets that are the source of information required for care decisions, and the communications and technologies that support information flows. Patient-centered care decisions, as discussed previously, depend on the sharing of information about these dimensions and held within each dimension. The sharing of pertinent information through interactions is a dynamic process.

![Figure 1. Healthcare Knowledge Management dimensions (Abidi 2008)](image)

Factors influencing information-sharing interactions are depicted in the Borgatti and Cross (2003) dynamic model of learning, as depicted in Figure 2. The success of intentional interaction is a function of the dynamic process of asking for the information and of relational conditions between the actors. The process of asking for information and providing information can be facilitated through (1) personal communication and (2) information technology that links actors in the network. The nature of actors’ information requirements (i.e., dependencies) provides an impetus for a relationship or tie between actors (Tillquist et al., 2002). Relational conditions can influence interaction differentially depending on the roles of the participants in the interaction. The nature of roles, dependencies and interactions are elaborated next as we describe our empirical study of patient-centered care for patients with diabetes.
METHODOLOGY

We used dependency network diagramming (DND) (Tillquist et al., 2002) to inform a structural approach to social network analysis (SNA) (Borgatti et al., 2002; Gabbay and Leenders, 2001). Whereas the “tie approach” to social network analysis focuses on the dyadic relationship between a given ego and alter (i.e., subject and object actors) to assess the strength of ties, the “structural approach” focuses on the structure of relationships in which the ego is embedded to identify holes (or conversely, closure) in the network. DND provides a schema for a detailed qualitative analysis of actors’ dependencies and interactions that constitute the structure of a network (Tillquist et al., 2002). In the DND schema, roles and actions collectively refer to the nature of actors’ purposeful participation in the actor network. A role, encapsulates a set of actions performed by an actor or actors to achieve a goal. An action is the means or procedure for the manipulation of resources to achieve a desirable or suitable goal. A resource is anything perceived as valuable by actors in support of performing their roles, such as information, specialized skills, materials, tools or equipment. When actors are unable to achieve their goals without relying on the outputs, resources or skills of another role, a dependency exits between the roles. A dependency forms the impetus for actors to establish network ties. Coordination refers to how actors interact and exchange information (i.e., communicate) to satisfy dependencies, thereby forming ties between actors. DND arranges these constructs – roles (actors, activities, goals), dependencies and coordination – diagrammatically to depict the structure of a network.

We applied four methodological rules specified by Tillquist et al. (2002) to ensure that the DND is parsimonious yet sufficiently detailed to facilitate analysis, as follows.

1. Scope: The scope of the diagram should encompass the roles involving communication to satisfy actors’ patient-specific information dependencies.

2. Activities: Concentrate on the essential units of activities for the purpose of analyzing dependencies and communications. Thus, we modeled a composite of activities as a single activity when they produced a single goal within the same role. Otherwise, we modeled activities separately.

3. Goals: Combine like goals that utilize the same supporting activities within a role.

4. Dependencies: Depict only one dependency from one role to another unless the dependencies are unrelated.

Applying these rules, we developed and refined the DND diagram in three phases. First, a detailed literature search was conducted to identify the components of DND (i.e., actors’ roles, actions, goals and information exchanged) within the context of diabetes mellitus healthcare in Ontario, Canada. Second, two rounds of semi-structured face-to-face interviews were conducted with a physician who has been involved in design and development of medical information systems. This enabled us to develop the DND and supporting descriptions within the context of the diabetes mellitus healthcare environment. Third, we walked through the DND with a medical specialist in chronic diseases during a one-hour face-to-face interview. This enabled us to refine the pertinent descriptions for the DND.

The final DND depicting communicative and informational ties between actors to satisfy interdependencies informed a data matrix for network analysis. The network density and patient centrality (i.e., geodesic distance) of ties was analyzed through UCINET software (Borgatti et al., 2002). Network density and patient centrality can quantitatively evaluate our hypothesis based on two cases informed by the qualitative distinction in the DND between (1) exchanges enacted through personal contact and (2) exchanges supported by integrated information systems. Supporting “integrated information systems” include available systems to coordinate and integrate all actors’ participation and exclude systems available to only a subset of
pertinent actors (e.g., patient-accessible clinical information portals or interactive pharmacy websites not available from all providers).

For validation, the DND and SNA analyses were sent to an independent expert – a clinical pharmacist experienced in care for patients with diabetes – for review and comments. We concluded the process of refining the DND and resultant SNA through experts when no further changes were identified (Miles and Huberman 1994). Further details on data collection are excluded due to space limitations.

ANALYSIS

Dependency Network Diagram

To test the stated hypothesis, we first identified the communicative exchanges among actors in the network depicted in our DND (Figure 3). Based on this, we analyzed the dependency network diagram and then assessed the network density and actor-centrality to test our stated hypothesis. Actors’ information dependencies and communicative exchanges are labeled from (1) to (6) in Figure 3 and elaborated as follows.

Figure 3. Resultant Dependency Network Diagram (DND)

(1) Patients exhibit risks or conditions they do not recognize as related to a diabetic condition and consult with a primary care physician (PCP) to reach an understanding of their symptoms. During consultations, physicians gather information from patients (e.g., family history, weight, diet and exercise habits). If physicians interpret patients’ risks and/or symptoms as indicative of diabetes they generate an assessment action plan to confirm diagnosis. Physicians integrate their knowledge of...
alternative medications and interventions to project potential impacts of alternative treatment plans, decide treatment plans specific to the patient, decide which other healthcare providers to engage, and communicate risks and treatment options to patients in terms that patients can understand. Thus, patients cannot complete their action-goals of recognizing their needs and articulating an objective (i.e., Patient-AG1 and Patient-AG2 respectively in Figure 3) until they can engage a physician. Exchanges between patients and physicians in support of coordinated treatment plan decisions are usually enacted through personal communications such as face-to-face meetings.

2 Under the supervision of physician(s), clinical professionals such as nurses, dieticians, certified diabetes educators and community practitioners gather information from patients and communicate risks, treatment options and skills to patients in terms that patients can understand. Standardized forms, medical language and protocols are used to record and exchange highly technical information among healthcare providers. Patients have the legal right to request their medical records but usually do not maintain their own records. Not all physicians and clinicians provide IS support for patients to access medical records and communicate with professionals. Instead, exchanges between patients and clinical professionals in support of coordinated treatment plan decisions are usually enacted through personal communications.

3 Patients with diabetes have a substantially higher risk of associated medical complications such as foot, eye and heart disorders. Therefore, patients depend on podiatrists, ophthalmologists and cardiac specialists, for example, who have the knowledge to interpret symptoms, set objectives, and plan actions (i.e., to satisfy patient action-goals AG1, AG2, AG3) for a narrow set of specialized conditions. However, patients are usually not aware of who alternative specialists are, their capabilities, and how to engage them. Thus, patients rely on PCPs’ knowledge of specialists and protocols of engagement; a reliance that is enforced by a requirement for official patient referrals from PCPs to physician specialists. Exchanges between patients and physician specialists are usually enacted through personal communication such as face-to-face meetings. Physician specialists also depend on information from the PCP and other healthcare providers. Providers usually exchange standardized medical records via paper and via inter-organizational information networks linking clinical information systems. Standardized forms, medical language and protocols are used to record and exchange information. Providers also communicate with other providers directly by phone, email or face-to-face when they require specialized information to inform treatment plans. Providers establish their knowledge of other providers’ specialties and establish the ability to communicate with them through similar medical education, experience, and by building a history of rich interactions. Usually, patients do not have similar education and experience and are not privy to providers’ communications and information systems.

4 Patients are directed to medical laboratories for specialized diagnostic tests. Medical technicians perform HbA1c, LDL, HDL, and urine albumin tests using specialized laboratory instruments and techniques, and they record their findings in standardized medical language and forms. This information is usually communicated back to the provider that requisitioned the test for interpretation and action planning in a subsequent patient consultation. Until this information is interpreted, patients cannot interpret symptoms, set objectives and plan actions (i.e., complete action-goals Patient -AG1, -AG2 and -AG3).

5 Patients diagnosed with diabetes depend on medications such as insulin, medical supplies and consumer medical devices to plan and perform purposeful action (i.e., satisfy patient action-goals AG3 and AG4). Only physicians can prescribe controlled medications, but pharmacists communicate self-administration instructions and the skills to use medical devices to patients in terms they can understand. Some pharmacies also use information systems to identify potential negative interactions of a new prescription with patients’ other medications. If a negative interaction is detected, the information is relayed back to the physician to modify the treatment plan and prescription. Not all pharmacies provide IS support for patients to access medical records and communicate with pharmacists, and pharmacies do not actively share customers’ prescription records with competing pharmacies. Instead, exchanges between patients and pharmacists to coordinate patients’ treatment plan decisions over their lifecycles are usually enacted through personal communication.

6 Regulators and insurers influence healthcare providers’ actions and decision-making. Regulators, such as physicians’ College of Physicians and Surgeons of Ontario, specify the “appropriateness” and the boundaries of medical practices that different providers are licensed to perform. For example, physicians are licensed to interpret patients’ conditions, decide patients’ medication regime and write prescriptions, whereas pharmacists are not. The boundaries and appropriateness of practices are communicated to healthcare providers through intensive education, publications, seminars, conferences and specialized knowledge bases. Patients are usually not aware of the boundaries of providers’ practice that influence providers’ actions and decision-making. Furthermore, patients’ insurers, both public and private, specify the medical treatments they will fund and how much they will pay for them. By law in Ontario, providers cannot extra-bill patients for most services
covered by government insurance. Therefore, providers’ treatment recommendations to patients can be influenced by their knowledge of the rates and coverage of specific patients’ insurance providers. Patients can choose private insurance programs but cannot usually access information about how much insurers pay for services and how providers perceive patients’ insurance coverage.

**Social Network Analysis**

We used information from the preceding DND analysis to construct a matrix of ties between actors in the case of (1) personal contact and (2) IS-supported contact. The matrix was used to assess the network density and patient centrality through UCINET software (Borgatti et al., 2002). Actor-network density computations show that the actors are well connected (Network density = 0.809 and Geodesic distance of 1.214). Furthermore, as can be noted from the graphical depiction of network ties in Figure 4, direct ties exist between the patient and all healthcare providers.

**Hypothesis.** The finding of direct ties between patients and healthcare providers supports the stated hypothesis when taking into account coordination among the actors enacted through personal contact. However, the hypothesis is not supported when examining coordination supported by integrated information systems. Integrated information systems support coordination among healthcare providers but patients are disenfranchised from potential benefits afforded by access to these systems. It is noteworthy to realize that even if patients had access to these information systems, they may not benefit from them because the content is highly technical. We elaborate on this issue next.

![Figure 4. Actors’ network ties for communication in support of patient-centered treatment plan decisions](image)

**DISCUSSION**

Diabetes mellitus is a chronic condition that involves numerous risks and associated medical conditions that patients need to actively manage over their lifecycles. Accordingly, patients are central and active actors that are expected to learn how to manage diabetes risks and conditions. For example, pre-diabetic patients need to develop a basic awareness of diabetes whereas diabetic patients learn to test and interpret their own blood pressure and blood glucose levels instead of relying on physicians and medical labs as they do during initial diagnosis. Furthermore, patients cannot achieve their management goals until they receive information essential to informing care decisions in a form that they can understand and act upon. Our actor-network analyses show that patients have direct ties for personal communication with healthcare providers but are disenfranchised from direct access to the integrated IS that benefit other actors. This may constrain patients’ ability to communicate effectively with healthcare providers in support of a coordinated patient-centered treatment plan. Nonetheless, providing patients with direct access to the integrated IS could be problematic due to their lack of shared knowledge with healthcare providers. Actors must possess cognitive proximity to communicate effectively.

Cognitive proximity refers to the presence of overlapping knowledge sets between actors that enables them to communicate with higher plausibility of mutual understanding (Montazemi and Chan, 1990; Te’eni, 2001). Healthcare providers develop close cognitive proximity through considerable investments in similar education, experience and organizational contexts. Patients, in general, do not develop the same close cognitive proximity with healthcare providers. Therefore, the plausibility is remote that patients can correctly understand technical information available in healthcare information systems to enable them to communicate effectively with healthcare specialists. Because of the knowledge asymmetry, direct access to
healthcare providers’ IS “as is” is unlikely to enable patients to communicate more effectively with healthcare providers. Instead, patients require IS solutions that help them to engage actors who can help them to reach an understanding about a situation and their plans of action (Te’eni, 2001). The preceding findings hold important implications.

IMPLICATIONS FOR PRACTICE, POLICY AND RESEARCH

While the findings from this research show that healthcare providers have access to integrated information systems, we found no evidence of integrated information systems that support patients’ participation in coordinated treatment plan decision-making. Policymakers should realign their investments with their strategy of patient-centered care by directing resources at integrated information systems that support patients’ communication requirements. However, simply providing patients with access to the same records that healthcare providers benefit from is insufficient due to knowledge asymmetry. Patients lack requisite knowledge that healthcare providers possess to leverage the available information in support of coordinated patient-centered treatment plan decisions. As asserted by Stead and Lin (2009), the deployment of healthcare IS will not be sufficient to achieve healthcare reform without greater emphasis on providing cognitive support for patients and healthcare providers. Therefore, this study highlights the need to incorporate knowledge asymmetry into IS design and IS research in order to identify how IS can help actors to access the interpretive support they need to understand and apply medical information as intended by experts. When actors lack information and processing skills and cannot access these resources when and as needed, they seek out other actors that can satisfy their needs to ameliorate the asymmetry (Gasson, 2006; Tillquist et al., 2002). This constitutes a compelling explanation for the rise in popularity of Internet-based online communities in healthcare.

The members of online communities voluntarily coalesce around “shared purposes, and they interact socially by adhering to tacit and explicit protocols, rituals, and roles using Internet technologies that support interaction” (Johnson and Ambrose, 2006, p.108). Communities are known to promote learned individual competence through diffusion of the collective knowledge of the group via social interactions (Lave and Wenger, 1991; Wenger, 1998). Through the sharing of narratives and participation in discussions with sub-communities that have different expertise, members develop competence to engage experts in sense making and experts collaborate to guide the learning and activities of community members (Ibid.; Orlikowski 2002). Therefore, patients may be able to access interpretive assistance when and as needed within online communities to develop enhanced competence to participate in patient-centered care decisions. In turn, providers may benefit when patients, through community participation, increase their competence to participate and to communicate their intimate knowledge about how improvements in health status affect their wellbeing (Hurley et al., 1992). Furthermore, healthcare providers can coordinate their collective expert knowledge in support of patient-centered care plans through the enabling mechanism of an online community (Abidi, 2008). However, online communities are faced with a number of problems such as misinformation (Johnson and Ambrose, 2006). Therefore, further research is needed to assess the costs and benefits of online communities in the context of patient-centered care.

Costs associated with managing Internet-based communities arise from three important sources. First, communal network structures may be optimal for coordinating distributed knowledge in support of highly complex problems, but prove inefficient for coordinating solutions to less complex problems (Nickerson and Zenger, 2004). Therefore, research is required to identify optimal design structures in the contingent context of the problems that communities are intended to address. Second, scholars studying communities find that governance mechanisms commonly employed in organizations can prove detrimental to the sustainability and performance of online communities (Brown and Duguid, 1991). Therefore, optimal governance mechanisms need to be identified for ensuring sustainable healthcare communities. Third, the literature asserts the vital importance of expert, leader and governing roles – for healthcare professionals in our case – to ensure responsible quality standards of community knowledge, behaviors and activities (Ibid.; Johnson and Ambrose, 2006; Lave and Wenger, 1991; Wenger, 1998). However, the optimal combination of design, governance and quality roles has not been empirically assessed. Therefore, further research is needed to identify community design, governance mechanisms and roles of healthcare providers that optimize the value of communities as an effective and efficient tool in support of patient-centered healthcare.

The findings reported in this paper are limited to patient-centered information flow within the context of the diabetes mellitus environment in Ontario. Future research could help us to understand the nature of patient-centered information flow within other healthcare contexts and/or jurisdictions.

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