Leveraging Social Network Analysis to Improve the Implementation of Evidence-Based Practices and Systems in Healthcare

Priscilla A. Arling
Butler University
parling@butler.edu

Bradley N. Doebbeling
Indiana University
bdoebbel@iupui.edu

Rebekah L. Fox
Texas State University
rf24@txstate.edu

Abstract

In healthcare, evidence-based practice (EBP) integrates clinical expertise with the best available external evidence from systematic research. Yet even with the aid of technology, implementation of EBP in many settings remains a challenge. This paper combines research from the fields of healthcare implementation science and social networks to present an integrated framework for the study of EBP-related information systems. We explore the application of the framework to a complex healthcare collaborative, the MRSA infection control project, a project intended to foster the implementation of EBP’s to reduce the spread of MRSA infections. We also consider how the framework can be used with other theories, to inform EBP-related information system implementations.

1. Introduction

Today’s healthcare organizations face challenges of unprecedented complexity, breadth and intensity. Only a fraction of new scientific discoveries and innovations enter day-to-day clinical practice [46]. Large studies of health care delivery demonstrate that fewer than half of physician group or solo practices use recommended processes of care [27]. Following recommended processes regarding patient care in a medical practice is often referred to as evidence-based practice. Evidence-based practice (EBP) integrates clinical expertise with the best available external evidence from systematic research [35]. To aid in the implementation of EBP, health care organizations frequently turn to technology, to quickly disperse innovations in patient care and guide decision making ([36, 47]). Technologies implemented often include evidence-based decision support as well as patient progress tracking and collaborative work systems.

However, even with the aid of technology, EBP frequently fails to be fully implemented and integrated into patient treatment. Part of the reason is due to the complexity of the healthcare system, which includes patients, providers or care teams, clinic or hospital management, as well as local community input, all of which are influenced by the current political and economic environment [17]. This set of interacting elements behaves differently than the elements acting alone would [34]. In considering healthcare change, it is important to consider a multi-level model of the healthcare system [28]. There is a need to understand the complexity of each of the levels of care as they contribute to the unique barriers and facilitators of a given context, in order to focus EBP implementation efforts.

In addition, multiple authors have noted that research in the area of EBP implementation has often lacked the rigorous scientific approach that is the hallmark of EBP research itself [15, 31, 37]. In a review of 235 evaluations of implementation strategies, most of the studies provided no rationale for their choice of intervention [20]. Studies frequently lack a theoretical and analytical base that would predict success in the implementation and often also fail to provide information on specific contextual features of the EBP implementation [37].

In this paper we suggest that one approach, social network analysis (SNA), is well suited to informing many aspects of EBP implementation. We position social network analysis within PARiHS, which is a widely published framework for conceptualizing EBP implementation. We integrate recent research on EBP implementation with the PARiHS framework and illustrate how social network analysis can be leveraged as a foundation for scientifically rigorous research.

Our goals in this paper are twofold. First, the paper provides a brief introduction to EBP implementation issues and the basics of social network analysis, for those who are unfamiliar with those areas. Second, the paper integrates work from the EBP, social network and information systems research disciplines to present research questions for future EBP-related information systems studies. A primary audience for the paper is healthcare practitioners who are looking for new approaches to improve their implementation of EBP systems. For social network researchers, the
Implementing evidence in practice involves a dialectical process (ongoing conversation) between parties that creates a shared understanding of benefits and risks of innovation.

Participants in the MRSA project often discussed differing attitudes toward evidence-based guidelines. Physicians and other providers can be skeptical that they could be the source of an infection, despite strong research evidence of in-hospital and clinic transmission between providers and patients. Patient and families of patients also at times express resistance to evidence that recommends repeated hand washing or wearing of gloves or gowns when a MRSA presence has been identified. A feeling of ‘that won’t happen to us’ can be difficult to overcome.

The second component in the PARiHS framework, context, refers to the environment or setting for the proposed innovation implementation. Conditions affecting context include organizational culture and leadership, as well as feedback mechanisms. Informal opinion leaders can also be part of the context.

Early in the MRSA project there was a recognition that more than just physicians and nurses needed to be considered part of the infection control context. Janitorial staff, orderlies, and volunteers all can play a role in the spread of infection. These roles need to be included in any cultural change or leadership effort to implement EBPs. Opinion leaders in various departments are also needed to help increase and maintain adherence to guidelines. Project participants emphasized the importance of understanding the unique physical contexts of each site, including the implementation and use of information systems. Information systems could facilitate infection control, with decision support systems and the presentation of guidelines. However systems could also hamper infection reduction efforts. For instance, when system hardware has to be placed on carts that are wheeled around the unit, infection containment is more difficult.

The third framework component, facilitation, describes the support required to help people change their attitudes and behaviors given the evidence and context. Facilitators actively work with individuals and teams to support implementation success.

A focus of the MRSA project was to assist facilitators in participating hospitals. This was accomplished by sharing information on EBP implementation successes and failures. For example, one successful method of facilitation was automated letters and brochures. Documents were sent to families of patients, both during a hospital stay and afterwards, to help to enforce learning about MRSA and increase compliance with EBPs that required action on the part of the patient. Another successful intervention was the
installation of special computer keyboards that could be totally immersed in disinfectant.

The PARiHS framework notes that the components of evidence, context and facilitation interact at multiple levels of analysis. This was highlighted in the narratives of success and failure of EBP implementations in the MRSA project. Many of the stories described the interactions needed between various levels of roles, units, and individuals. However, while narratives were useful, the participants desired a better way to understand the complexity and structure of these interactions.

The challenge therefore exists to find theoretical and analytical perspectives that could inform an understanding of how the components of the PARiHS framework interact [23]. In the next section we discuss one theoretical and analytical basis that is well suited to this purpose, social network theory and analysis. We then propose how social network constructs could be applied to the study of EBP implementation.

3. Social network analysis

Social network theories posit that the structures of relationships between elements and the position of elements in those structures can predict and explain a host of outcomes at multiple levels of analysis [6, 21, 43]. Social networks have been studied in numerous fields, including organizational and healthcare research, and have been used to explain the diffusion of innovations, technology use and knowledge transfer [1, 30, 39, 40], among other outcomes. A key analytical approach for many social network studies is social network analysis. Social network analysis (SNA) is a sub-field of study within structural sociology that uses graph theory and algebraic notation to define and formalize sociological constructs [44]. Its focus is on the relationship between social entities and the structure of social relations that determine the content of those relationships [29, 43].

At the kickoff meeting for the MRSA project, participants were asked:

- Which hospital or organization do you represent?, and
- In the last 12 months, with whom have you worked on MRSA related activities?

Table 1 describes the organizations represented in the project. Figure 1 is a graphical representation of where work relationships exist between the organizations. Figure 2 shows relationships between individuals. Each organization’s and individual’s name has been changed to a pseudonym.

In social network analysis, individuals, teams, departments or organizations can each be considered actors, and each actor is a node in a network. In Figure 1, the organizations that participated in the kick-off meeting are represented as nodes. In Figure 2 individuals are nodes. Visual inspection of Figure 1 provides insight into where relationships exist across organizations. In Figure 1, each node is represented by a different color and shaped symbol. For example, ‘Main Street Hospital’ is a local provider and is shown as an inverted blue triangle. Actors in a network are connected via their relationships, known as ties. Ties are typically categorized by content or type, such as friendship or workflow. The ties in Figures 1 and 2 represent where prior working relationships exist between organizations and individuals. Multiple types of ties between actors are often studied at one time. Each set of ties under study is considered to be a separate network relation, that is, a separate social structure.

<table>
<thead>
<tr>
<th>Organization (Pseudonym)</th>
<th>Organization Type</th>
<th>Figure 1 symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic College</td>
<td>Academic</td>
<td>Green circle</td>
</tr>
<tr>
<td>Research U</td>
<td>Academic</td>
<td>Green circle</td>
</tr>
<tr>
<td>University Tech</td>
<td>Academic</td>
<td>Green circle</td>
</tr>
<tr>
<td>Community Rep</td>
<td>Community Contact</td>
<td>Pink square</td>
</tr>
<tr>
<td>Consultant 1</td>
<td>Consultant</td>
<td>Black triangle</td>
</tr>
<tr>
<td>Consultant 2</td>
<td>Consultant</td>
<td>Black triangle</td>
</tr>
<tr>
<td>Consultant 3</td>
<td>Consultant</td>
<td>Black triangle</td>
</tr>
<tr>
<td>Healthcare Consultant</td>
<td>Consultant</td>
<td>Black triangle</td>
</tr>
<tr>
<td>FedAgency 1</td>
<td>Federal Agency</td>
<td>Dark blue square</td>
</tr>
<tr>
<td>FedAgency 2</td>
<td>Federal Agency</td>
<td>Dark blue square</td>
</tr>
<tr>
<td>City Hospital</td>
<td>Local Provider</td>
<td>Inverted light blue triangle</td>
</tr>
<tr>
<td>MainStreet Hospital</td>
<td>Local Provider</td>
<td>Inverted light blue triangle</td>
</tr>
<tr>
<td>Neighborhood Hospital</td>
<td>Local Provider</td>
<td>Inverted light blue triangle</td>
</tr>
<tr>
<td>Private Provider</td>
<td>Local Provider</td>
<td>Inverted light blue triangle</td>
</tr>
<tr>
<td>Non Local Provider</td>
<td>Non Local Provider</td>
<td>Red circle</td>
</tr>
</tbody>
</table>

![Figure 1. SNA graph MRSA project organizations](image-url)
Each network can exhibit different patterns and have different implications for the actors involved. The determination of who is considered to be in a network and who is outside of the network specifies the boundary of each network. The boundary for the network shown was determined by who was participating in the MRSA project at that time. Finally, ties can be valued or given a strength indicator. When studying communication a common measure for the strength of a tie is the frequency with which it is utilized. For instance, how often John talks to Jane. However tie strength can be measured in many different ways [25]. For instance, in the Figure 1 network, the strength of the tie could be calculated as the number of contacts who have worked with each other across the organizations. In Figure 1 the strength of the relationship is shown by the thickness of the tie line. Heavier lines indicate more contacts. The heavy line between ‘Private Provider’ and ‘HealthCare Consultants’ means there are more individuals involved in that relationship that in the thin line between ‘Private Provider’ and ‘Town Hospital’.

The density of a network is the number of actual ties that exist between actors as compared to the number of ties that potentially could exist in the network [43]. In the MRSA Figure 2 network, the density value calculated is 0.08. Density values are useful when values of different networks in the same study or values across time are compared. For instance, West and colleagues [45] asked 50 clinical directors of medicine and 50 directors of nursing: with whom do you discuss professional matters? The nurses’ professional networks were less dense (density=0.81) than those of the clinical directors (density=0.93). The nurses tended to discuss professional matters with people who did not communicate with each other, or who did not communicate with each other very frequently. In SNA terms, ties between people who do not contact each other or who contact each other infrequently are sometimes called weak ties. The authors suggest that the lower density and weak ties in the nurses’ networks correspond to access to a wider range of opinions from others than the opinions available to clinical directors. Indeed weak ties are frequently considered beneficial since they tend to connect individuals to new, novel sources of information. For instance, Granovetter discovered that people often find new jobs through weak ties rather than strong ties [19]. In other situations however, higher density in a network may be desirable. Aydin and colleagues found that increased communication network density in a network of nurse practitioners and physicians was associated with higher use of an electronic medical records system [3].

The research above highlights a few examples of how SNA can be used in a variety of settings and at a variety of levels of analysis to analyze and predict outcomes associated with social relations. We suggest that social network analysis can be a useful tool for researchers seeking to better understand and improve the implementation and dissemination of evidence-based practice and related information systems. In the next section, we outline how the analytical concepts discussed above can guide EBP implementation and systems research. We consider how the concepts and features of SNA may address the problems of EBP research discussed earlier, and how the integration of those concepts with information systems research.

4. SNA and EBP implementation

Table 2 presents an integrated PARiHS/SNA framework that suggests how common SNA constructs could be used together with the components of PARiHS to examine factors related to EBP implementation. Tables 3, 4, and 5 consider each row...
in Table 2 in more detail. In the sections that follow, we consider how SNA constructs could be applied to both the MRSA project and other, future EBP implementation research.

4.1. Evidence and network analysis

Table 3 outlines the ways in which social network analysis can inform the study of the evidence component of EBP implementation. The source and availability of evidence can be examined through network types and ties. The information gathered relies to a large extent on the question asked when the researcher is collecting the network data. In the MRSA project, a network question could ask ‘with whom have you exchanged information regarding how to reduce the spread of MRSA?’ The type of network being studied would be a MRSA reduction information exchange. A network of ties could be constructed showing how evidence currently flows between individuals in the project, showing sources and availability. Separate networks could be formulated, based on the media or information system used for the exchange.

Table 2. Integrated PARiHS/SNA framework

<table>
<thead>
<tr>
<th>Evidence (see Table 3 for more details)</th>
<th>Context (see Table 4 for more details)</th>
<th>Facilitation (see Table 5 for more details)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence comes from multiple sources and same evidence is not available to or accepted by all</td>
<td>Implementation is influenced by roles, leadership, community, culture, historical relationship, and feedback at different levels</td>
<td>Active agents of change increase the likelihood of implementation success</td>
</tr>
</tbody>
</table>

Respondents could also be asked how often they contact each other to exchange MRSA related information, for example, every day, once a week or once a month. This would allow the researcher to assign a strength or tie value. Experiential knowledge of evidence could be influenced by who someone talks to and how often. Frequency and strength data from electronic communication systems could also be captured automatically. Note that the question above differs from the question posed at the kick-off meeting, which asked respondents about working on MRSA related activities with others. With SNA surveys, the wording of questions is critical to what contacts will be identified. Pre-testing of questions is recommended in order to ensure that the desired responses are evoked.

A frequent source of evidence in organizations is opinion leaders, who also shape the dialectical process involving evidence. Opinion leaders could be identified in at least two ways via SNA. First, a separate network type could be drawn based on the question “Whose opinion do you seek out regarding MRSA related information?” Content analysis of automated communication could also identify leaders and provide information on who is talking to whom about evidence. Second, opinion leaders could be identified based on analysis of network patterns.

Table 3. The application of SNA constructs to factors influencing evidence

| Evidence: Multiple forms of evidence influence practice | Source: Evidence comes from research, clinical experience, patient preferences and local data | Availability: The same evidence is not equally available to all |
| Process: Implementation of evidence involves a dialectical process, often shaped by opinion leaders | Strength: Experiential knowledge strengthens related research evidence |
| Understanding: Shared understanding of evidence is influenced by social and cognitive boundaries |

Network types and ties: What actors are involved in the exchange of forms of evidence, how often they exchange that information, with whom; what is the value/strength of those ties; who has contact with which opinion leaders

Network patterns: characteristics such as a network’s density or level of centralization may influence spread, adoption, non-adoption of evidence; characteristics can indentify informal opinion leaders and their contacts

Blockmodels: an SNA analytical technique that can identify subgroups within larger networks that are interdisciplinary and/or multiprofessional

Network boundaries: describe who is in/out of team, unit, or profession and thus who exerts influence

A common pattern examined is who is most central in a network. Social network theory suggests that actors physically central in a network are typically the most powerful, since information in the network flows through them. This could impact evidence availability, perceived strength of evidence and the dialectical process. A visual inspection of Figure 1 suggests that ‘Main Street Hospital’, ‘Private Provider’, ‘Research U’, ‘Consultant 1’ and ‘HealthCare Consultants’ are the central actors in this network and could be considered opinion leaders. Quantitative analysis of the network using UCINET network analysis software [5] tells us that ‘HealthCare Consultants’ has the highest level of centrality, with 25 more contacts that next closest central actor, ‘Consultant 1’. Based on centrality analysis, ‘HealthCare Consultants’ may be considered the opinion leader in this network.

Another pattern that can be analyzed is the density of a network and each sub-network. Although ‘HealthCare Consultants’ has a high number of
contacts, its sub-network density is among the lowest (density = 0.47). Compared to the other organization’s networks, ‘HealthCare Consultants’ contacts are not in communication with each other. Density may influence availability and strength of evidence. Prior work suggests that dense networks are beneficial for the quick diffusion of existing information within a network, while less dense networks are more likely to bring new information into a network [10]. This suggests that less dense networks may be advantageous during the early stages of evidence diffusion, when the evidence needs to be introduced into new networks in order to spread. However, the presence of more dense networks later in the evidence’s life cycle may promote quicker diffusion in networks where some knowledge of the evidence already exists.

The implementation of EBP evidence is also influenced by shared understanding. Blockmodel analysis is a type of SNA pattern analysis that could highlight subgroups that would likely have a shared understanding. Using UCINET, we looked for subgroups of organizations in the MRSA network that have similar patterns of relationships. The partial output is shown in Figure 3. The organizations have been grouped into four blocks by UCINET. It is interesting to note that each block contains a variety of organization types. Burt developed a complementary methodology to blockmodeling, called structural equivalence, that examines actors with similar relations [9, 43]. He re-analyzed social network data collected by Coleman and colleagues [11] on tetracycline adoption among physicians in Illinois. Burt found that structural equivalence predicted the physicians who were in ‘competition’ relationally with each other. Physicians were more likely to adopt practices implemented by their ‘competitor’ [9]. Based on Burt’s findings, we would expect organizations with similar relations across our blocks to have shared understandings and to adopt similar practices.

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be used to assess leadership. Network boundaries can be set to assess the level of reach of leadership across team, units or organizations.

The culture, standards and beliefs of the organizations can be assessed through questions that identify different network ties and characteristics of those ties. For example, respondents may be asked about their level of trust in the members of the network or the timeliness of information they receive from each contact. Based on the implementation research discussed earlier, we would expect that when contacts are high in trust or share similar professional experiences, an EBP implementation will be positively influenced. Context may also be derived after data collection by determining the characteristics of each actor, including team role, organizational title, position in the organizational hierarchy, or profession. In the MRSA kick-off meeting network analysis, the organization context was determined in this way.

Leadership and culture can be also evaluated through network patterns. Individuals who are located centrally in a network are frequently considered leaders and have the power to get things done in the group [7, 24]. Network patterns can predict the degree to which norms will be shared across network boundaries and the level of cooperation that is likely to occur across groups [32]. In terms of EBP implementation, the boundaries could be formed by roles, professions, organizations, communities, economic or political contexts. Network patterns are also useful in assessing the impact of contacts who are feedback assessors or evaluators, by identifying the flow of information to and from those contacts. Prior work suggests that feedback assessors who are central in a network are more likely to have power and influence over the actions of others in the network.

How culture impacts individual beliefs, standards and information sharing could be measured as part of the tie type and strength in a network. For instance, ‘How strongly do you believe you should share information about (the innovation) with (each) network contact?’ In the MRSA network, culture is likely to differ on many levels and by network type, including member profession, organization type, and geographic location. Figure 1 suggests that the project will need to successfully bridge many different cultures, since multiple types of organizations are represented: providers, academics, consultants and federal agencies.

The history of relations could influence implementations as well. During the MRSA project network data could be collected a various points of time, to show changes in relations. Figures 1 and 2, showing ties that existed at the kick-off meeting, could be compared to network patterns that exist later in the project life. It would be expected that the number of ties would increase over the project’s life, facilitating the spread of information. We would also expect the calculated levels of cohesion and density to increase over time. Additionally, blockmodel analyses could be performed to find historical subgroups by profession, geographies, economic conditions or political groups.

Finally, feedback loops and sources of evidence evaluation could be assessed in similar ways as other contextual elements. Network types and ties can determine who provides feedback to whom and how often, with patterns showing the degree of reach of feedback providers. Blockmodels would also show subgroups, within which feedback would tend to be reinforced by subgroup members.

4.3. Facilitation and network analysis

Table 5 outlines the ways in which social network analysis can inform the study of the facilitation component of EBP implementation. The easiest way to assess the impact of facilitators is to include them as nodes in each network type analyzed. Their position in the network pattern would be highly informative. The more central the facilitators are in the network, the higher their influence. Density of the facilitators’ network also indicates whether the network is more apt to spread existing knowledge or introduce new knowledge. We would also expect that facilitators would span network boundaries, linking different networks and network subgroups, and positively impacting the EBP implementation in that way. The networks that facilitators span would also provide insight into the cultures, norms, and beliefs that facilitators are exposed to and may be transferring to other networks. In the MRSA project, a network based on individual nodes would be used to assess patterns related to any formal facilitators. At an organizational level, Figure 1 shows that there are many organizations in the network and that each organization has at least two ties with another organization in the network. This combination of density and boundary spanning would be expected to facilitate the spread of new information throughout the network.

While the PARiHS framework emphasizes formal facilitators, network analysis could also reveal emergent facilitators, and even differentiate these individuals from opinion leaders. This could be accomplished by asking two separate network questions. To determine ad-hoc facilitators the question could ask: “From whom in this team (or organization) have you received assistance in implementing the innovation in terms of guidance, support or facilitating change?” This would differ from a question intended to find opinion leaders, which
may be as broad as “Whose opinion do you value concerning the implementation of the innovation?”

Table 5. The application of SNA constructs to factors influencing facilitation

<table>
<thead>
<tr>
<th>Implementation Component</th>
<th>Key Ideas / Findings from research</th>
<th>Related SNA Constructs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitators act upon given evidence and context to affect implementation</td>
<td>Facilitators: Active agents of change increase the likelihood of implementation success</td>
<td>Network types and ties: who has contact with facilitator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Network patterns: how does facilitator’s position and others’ positions in networks influence outcomes; patterns can evaluate facilitator’s perceived power, level of influence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Network boundaries: what are the bounds of the facilitator’s reach; how does reach vary by type of network contact</td>
</tr>
</tbody>
</table>

The examples of SNA provided above are just a few of the many types of analyses that could inform EBP implementation. Wasserman and Faust’s [43] text contains excellent descriptions on how to analyze network patterns and also lists key research in the area. In the health and medical fields, several authors who have investigated density were cited above. Research on centrality in the health field includes studies on physician prescribing behavior [16], advice seeking among hospital staff [13] and inter-organizational partnerships in primary care [26]. Blockmodels have been used to look at the diffusion of technology in a private group practice [2] and technology’s impact on roles and relations within radiology departments [4].

5. Future research into EBP-related information systems

The integration of the PARiHS framework and social network analysis offers a multidisciplinary and multilevel perspective that can inform future research on EBP-related information systems. In a recent literature review of studies of healthcare quality improvement strategies (QIS), clinical information systems and decision support systems were frequently cited as key factors in effective strategies [36]. QIS that have been found to benefit in particular from technology support include clinical practice guidelines and chronic disease management programs, which included evidence-based decision support and patient progress tracking systems.

The integrated PARiHS/SNA framework could be used in conjunction with many of the theories typically used to study information systems. In the next two sections we consider just two of the core theories, the diffusion of innovation and the technology acceptance/UTAUT models. We put forth research questions that have the potential to advance the study of EBP implementation by merging these theoretical bases with the framework here.

5.1. Diffusion of innovations

The adoption and use of information systems in organizations has frequently been characterized as the diffusion of innovations (e.g. [12, 38]). The diffusion of innovation theory [33] suggests that individuals possess different levels of willingness to adopt innovations. Individuals can be placed into five categories depending upon when they are expected to adopt the innovation. These categories are innovators, early adopters, early majority, late majority and laggards. The adoption rate is influenced by five factors: relative advantage, compatibility, trialability, observability and complexity.

The PARiHS/SNA framework suggests the following research questions regarding the diffusion of EBP-related information systems:

- What is the relationship between sources of evidence and categories of adopters? How do the network characteristics, ties and strength influence the rate of adoption and sources of evidence?
- What are the key contextual aspects that influence adopter categories and rates of adoption? What are the social structures that relate to those aspects and how do those structures relate to diffusion?
- How and in what ways, do the networks of facilitators influence technology adoption rates?

5.2. Technology acceptance/UTAUT models

The technology acceptance model (TAM), in its simplest form, postulates that perceived usefulness and perceived ease of use predicts the intention to use a system, which predicts subsequent system use [14]. Venkatesh and colleagues merged TAM with components of several other technology acceptance models to develop a Unified Theory of Acceptance and Use of Technology (UTAUT) [42]. In the UTAUT model the intent to use technology is predicted by performance expectancy, effect expectancy, social influence and facilitating conditions. Facilitating conditions also directly influence use behavior.

The PARiHS/SNA framework suggests the following research questions regarding the acceptance and use of EBP-related information systems:

- How do networks of clinical professionals and opinion leaders exert social influence on the intent to use EBP-related information systems?
- What EBP-related contextual factors are key conditions for intent to use? How do those
factors/conditions vary across networks of groups and across subgroups within larger networks?

- What are the characteristics of facilitator networks that positively influence intent and use behavior?

6. Conclusion

Large studies of health care delivery demonstrate that there are major gaps between evidence and practice. Information systems can play an important role in implementing evidence-based practice. However many factors influence the successful implementation of EBP and use of EBP-related information systems.

A healthcare system is comprised of multiple levels and elements. Research that seeks to enhance EBP implementation must account for multiple elements and their interconnectedness. Implementation research must also be based on a strong theoretical and scientific foundation. Kitson and colleagues [23] suggest in the PARiHS framework that successful implementations are the function of interplay between evidence, context, and facilitation.

Social network analysis can inform an understanding of how the elements of the PARiHS framework interact. SNA is particularly useful due to its focus on the relationship between social entities and the structure of social relations that determine the content of those relationships. Social network analysis holds great promise for informing efforts to improve the uptake of EBPs via information systems.

This paper presented an integrated PARiHS/SNA framework. The framework could be used in conjunction with theories used to study information systems, to provide a strong theoretical and analytical approach to evaluating and implementing EBP-related systems. By using a multilevel, multidisciplinary approach, future research can identify those EBP innovations and systems that will be most successful in a variety of settings.

7. References


