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Exploring the use of social network methods in designing healthcare quality improvement teams☆

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ABSTRACT

Teams are an integral component of quality improvement efforts in healthcare organizations. Quality improvement teams may involve persons either from the same or different disciplines. In either case, the selection of team members may be critical to the team's success. However, there is little research to guide selection of team members for quality improvement teams. In this paper, we use tools from social network analysis (SNA) to derive principles for the design of effective clinical quality improvement teams and explore the implementation of these principles using social network data collected from the inpatient general medicine services at a large academic medical center in Chicago, USA. While the concept of multidisciplinary teams focuses on the importance of the professional background of team members, SNA emphasizes the importance of the individual and collective connections of team members, both to persons outside the team and to each other. SNA also focuses on the location of individuals and groups between other actors in the flow of information and other resources within larger organizational networks. We hypothesize that external connections may be most important when the collection or dissemination of information or influence are the greatest concerns, while the relationship of team members to each other may matter most when internal coordination, knowledge sharing, and within-group communication are most important. Our data suggest that the social networks of the attending physicians can be characterized sociometrically and that new sociometric measures such as "net degree" may be useful in identifying teams with the greatest potential for external influence.

Introduction and background

Team-based approaches to patient care and quality improvement have been broadly promoted to address gaps in healthcare quality and safety in the U.S. (Bodenheimer, 1999). Defined as a group of individuals working interdependently to achieve a shared goal, teams have been advocated by the Institute of Medicine (IOM) as an imperative in the redesign of healthcare delivery systems (IOM, 2001), and a cornerstone of safer healthcare organizations (IOM, 2000, 2007). Teams have been identified by the National Quality Forum™ (NQF) as critical components of a "culture" of healthcare quality and safety (NQF, 2007), and The Joint Commission has identified improved team communication as a National Patient Safety Goal (Joint Commission, 2008). Teams are also a core concept in many popular models of healthcare delivery and quality improvement (QI), including: "shared," (Smith, Allwright, & O'Dowd, 2008) "collaborative," "multidisciplinary," (Mitchell, Brown, Eriksson, & Tieman, 2008) "interprofessional," (Lingard, Espin, Evans, & Hawryluck, 2004; Vyt, 2008) and "interdisciplinary" models of care; the Chronic Care Model (Wagner, 2000); total quality management (Lammers, Cretin, Gilman, & Calingo, 1996; Øvretveit, 2000); continuous quality improvement and other systems-based quality improvement methods (Mohr & Batalden, 2002).

Despite the conceptual popularity of teams in healthcare quality improvement, little systematic theory and research has focused on the design and construction of such teams. How should team members be selected in order to increase the effectiveness of the group in modeling and/or disseminating behavior change within a larger social environment such as an organization?

To address this question, we draw upon the large body of research on social networks which has demonstrated how

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a person's location within a social network can affect the volume, quality, and timeliness of information to which he/she has access, and how connections within a group can affect group cohesion, coordination, trust, knowledge sharing, and problem solving/innovation. Our approach is grounded in the view that social relationships are a valuable resource that can be used to improve the flow of information and influence to achieve desired outcomes. In other words, relationships are "social capital" (Coleman, 1988) that can be productively used in healthcare settings to improve quality. We argue that teams should be constructed not only to optimize the quantity and types of human capital available to the team, but also the amount of social capital available. Building on the analysis of Burt (2005) and other contributors to the management literature on teams (Cross, Ehrlich, Dawson, & Helferich, 2008), this requires choosing individuals based on their connections to persons both within and outside the team.

While previous studies in the clinical literature have used social network principles to identify effective single opinion leaders (Kravitz et al., 2003; Soumerai et al., 1998), we are not aware of prior studies that have used SNA to improve the design of quality improvement teams in healthcare, which is our ultimate goal. Our objectives in this paper are twofold. First, we apply theoretical concepts and basic methods of social network analysis (SNA) to develop a systematic approach to quantitatively describing the social environment within healthcare organizations, and to develop general principles based on SNA metrics for constructing quality improvement teams that will effectively disseminate interventions and effect behavior change. Second, we use data on the social network of attending physicians on the general medicine inpatient services at one institution to demonstrate how these principles can be applied to the design of teams.

Building better teams using social network analysis

Much of the current clinical literature on teams has been informed by insights gained from quality improvement process evaluations (e.g. Grumbach & Bodenheimer, 2004), or from professional perspectives and expert opinion (Harolds, 2005; Junger, Pestinger, Elsner, Krumm, & Radbruch, 2007; Mickan & Rodger, 2005; Weinreb, 2004). This literature suggests that teams should be comprised of healthcare professionals with different professional (Harolds, 2005) and diverse sociodemographic backgrounds (Harolds, 2005; Xyrichis & Lowton, 2008). Close communication is an important attribute (Grumbach & Bodenheimer, 2004; Junger et al., 2007; Mickan & Rodger, 2005; Xyrichis & Lowton, 2008). Effective healthcare teams are also often characterized by having clearly articulated, shared goals and objectives (Grumbach & Bodenheimer, 2004; Mickan & Rodger, 2005; Saltman et al., 2007; Weinreb, 2004; Xyrichis & Lowton, 2008); strong team leadership (Mickan & Rodger, 2005; Weinreb, 2004), and a sense of trust and commitment among team members (Junger et al., 2007; Mickan & Rodger, 2005). The size of team is also often cited as important, with teams including between 5 and 15 members considered to be best in many cases (Grumbach & Bodenheimer, 2004; Harolds, 2005; Weinreb, 2004).

Although the importance of social networks has been acknowledged in the field of implementation science, they have largely been viewed as an environmental or contextual feature that may mediate the effects of a quality improvement intervention, or that may prove to be a barrier or facilitator in diffusion (Rubenstein, Mittman, Yano, & Mulrow, 2000). A recent paper by Braithwaite, Runciman and Merry (2009) argues that healthcare quality improvement efforts can be made more effective by exploiting social capital inhering in the informal social ties that "naturally" form and evolve over time within organizations. Social capital refers to the resources that are "embedded" within social relations between individuals (Lin, Cook, & Burt, 2001; Podolny & Baron, 1997), as well as the overall structure of those relations (Burt, 1992; Burt, 1995; Coleman, 1988). While the productivity of social capital has long been recognized in sociology (Coleman, 1988; Portes, 1998), political science (Putnam, 1994), and economics (Becker, 1998), it is a relatively recent import within the literature on clinical organization and processes. Little has been done to apply concepts, theoretical principles, and/or methodological tools from SNA to develop a systematic implementation approach for team-based quality improvement interventions. Yet, SNA may inform a number of challenges inherent in team design, e.g. who to select for the team (team composition), and how to structure the team (team organization). In this paper, we focus on team composition.

A detailed review of social network theory is beyond the scope of this paper, but the essential concepts needed to convey the value of SNA for guiding team composition can be illustrated in Fig. 1.

A simple definition of a social network is that it is a set of social actors and the ties among them. Fig. 1a lists a set of hypothetical social *actors* in our example network. To align with the empirical analysis below, one can imagine that the 15 actors listed are inpatient attending physicians and that they belong to two different groups —general internists (labeled by numbers), and hospitalists (labeled by letters). Fig. 1b presents what is known as a *sociogram* – a visual diagram of a social network in which actors are represented as nodes or vertices between lines which depict connections or "ties" between actors. In Fig. 1b, attending physicians are represented by circles, and the relationships between them by lines. Depending on how relations between actors are measured, ties may reflect patterns of: observed interaction or communication; advice; help seeking or provision; resource exchange; information flows, or some other form of social exchange. To be consistent with the data we show later, let us assume that the ties in this hypothetical sociogram reflect patterns of interaction among attending physicians. Information contained in a sociogram can yield a number of simple, yet powerful, measures that can inform decisions about team composition. These measures typically pertain to the relationship of team members either to persons outside the team, or to each other. Based on Burt's (2005) work as well as work by others (Oh, Chung, & Labianca, 2004; Ramanadhan, Wiecha, Emmons, Gortmaker, & Viswanath, 2009; Reagans & Zuckerman, 2001) on the comparative advantages of intra-team ties for fostering group cohesion and extra-team ties for information seeking and strategy, we hypothesize that external ties may be more important when the primary function of QI teams is to collect or disseminate information or to act as direct agents of social influence. We also hypothesize that ties among teammates may matter more in circumstances that place a premium on internal coordination, knowledge sharing, and communication.

Using SNA measures of external team connections to select team members

Clinical and management literatures both suggest the value of teams comprised of members who bring varied skills and resources to a group. However, organizational and management literature on teams and social networks provide additional insight into the conditions under which team diversity is beneficial. Diversity in demographic background and organizational experience increases cognitive and perceptual heterogeneity within the group, and this can reduce inertia and catalyze the group in effecting change within the broader organization (Wiersema & Bantel, 1992). Functional diversity – that is, diversity in the skills and professional background – particularly enhances team performance on tasks requiring innovation and creativity (Bantel & Jackson, 1989; Simons, Pelled, & Smith, 1999). On the other hand, team diversity