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**EPISTEMIC INFLUENCES ON KNOWLEDGE TRANSLATION IN
HEALTHCARE: THE MEDIATING ROLE OF SOCIAL NETWORKS**

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INTRODUCTION

The benefits of translating knowledge across the boundaries of expert groups in healthcare are well established; improved coordination between such groups (Mascia, Pallotti, & Dandi, 2018), improved performance in operational tasks (Baumbusch, Kirkham, Khan, McDonald, Semeniuk, Tan et al., 2008; Rangachari, 2008), and greater ability to innovate new treatments and services (Greenhalgh, Robert, MacFarlane, Bate, & Kyriakidou, 2004) are all seen as resulting from improving the knowledge flow between researchers and front-line staff. However, the challenges posed by that task are also great. Professional boundaries may be difficult to overcome (Ferlie, Fitzgerald, Wood, & Hawkins, 2005), and the costs involved, including the costs of developing social ties (Borgatti & Cross, 2003; Hansen, 1999), may be high. One such challenge, which provides the focus for the present study, relates to the influence of epistemic differences upon knowledge translation efforts. Such differences reflect the distinctive ‘ways of knowing’ developed by different expert groups (Brown & Duguid, 2001) (Guzman et al., 2015; Mitchell, Boyle, O’Brien, Malik, Tian, Parker et al., 2017). They encompass both epistemological differences over what counts as knowledge, and different approaches to producing knowledge (Albert et al., 2009; Currie et al., 2014; Knorr-Cetina 1999). Overall, epistemic differences are characterized by different social, discursive and material practices and are embedded in particular ‘cultures’ or ‘communities’ (Hussler & Rondé, 2007; Robertson et al., 2003).

Recent studies on interdisciplinary initiatives designed to support knowledge translation have highlighted the *direct* effect of epistemic differences arising from the relative status, or legitimacy attached to different forms of knowledge, research or evidence by expert groups (Currie et al., 2014; Mitchell et al., 2017). Less attention has been paid so far to the *indirect* effect of epistemic differences. In particular, we currently have little knowledge about whether and how epistemic differences are implicated in the emergence of the informal social networks which are seen as so central to knowledge translation (Currie & White, 2012; Lockett et al., 2014). This *indirect* influence of epistemic differences thus represents an important gap in our existing understanding. In our study, we examine the ways in which such differences are implicated in the development of social network ties. Our study focusses upon a particular, policy-led knowledge translation initiative– the Collaborations for Leadership in Applied Health Research and Care (CLAHRCs) initiative in the English National Health Service (NHS).

EPISTEMIC DIFFERENCES AND KNOWLEDGE TRANSLATION

The salience of epistemic differences in various forms of knowledge translation activity is highlighted by a number of studies internationally. For example, a Canadian study of boundary work in health research found that biomedical researchers and clinical scientists constituted distinct ‘epistemic cultures’, which privileged certain forms of scientific activity over others (Albert et al., 2009). Amongst this group, social science was seen as ‘an activity of lower scientific importance’; a finding which has important implications for the possible conduct of interdisciplinary research, leading to, at best, a ‘subordinate’ role for social scientists in such research (Albert et al., 2009, p. 174).

These findings highlight the privileging of certain forms of knowledge, and the marginalization of other forms, notably social science knowledge, in interdisciplinary

collaboration. They are echoed and reinforced by recent studies of knowledge translation in healthcare which have found epistemic differences exerting a significant influence on the outcomes of collaboration (Currie et al., 2014). The epistemic differences highlighted in these impose constraints on interdisciplinary collaboration by reinforcing established differentials in status, power and legitimacy, even within the context of initiatives explicitly funded to promote knowledge translation (Currie et al., 2014; Morgan et al., 2011). The focus of our study, however, was not upon these direct effects but on whether and how epistemic differences exert an indirect effect through the formation of social ties. This question is important because informal social networks have been viewed as an important mechanism for overcoming the constraints on interdisciplinary collaboration highlighted above (Currie & White, 2012; Long et al., 2014).

Through a review of the existing literature relating to social networks and knowledge translation, we identified two principal ways in which epistemic factors might exert such an indirect influence. The first arises from ‘homophily’; that is, the tendency for individuals to form social ties with people like themselves (Long et al., 2012; McPherson et al., 2001). Homophilic clustering of ties has been previously found to be associated with professional roles (West & Barron, 2005; Bunker & Lengnick-Hall, 2018). If epistemic influences are socially meaningful (as suggested by the work on epistemic communities), they may encourage homophily within knowledge translation initiatives, such that individuals share knowledge only with those of a similar epistemic background.

The second way in which epistemic differences may influence social networks relates to the boundary-spanners (be they individuals or other units) which span disconnected clusters of actors. Boundary spanning positions are widely viewed as crucial for knowledge translation work in healthcare because they enable interactions between relatively disconnected professional groups (McGivern & Dopson, 2010; Ferlie, 2010; Oborn et al., 2013). Previous studies suggest that the ability of groups and individuals to effectively exploit such boundary-spanning opportunities may be influenced by their professional affiliations (Currie & White, 2012), the breadth of their expertise (Tortoriello et al., 2011), and their relative status and seniority (Lockett et al., 2014).

While the studies above are suggestive of the ways in which epistemic factors may influence social ties in a healthcare setting, this question not been studied directly to date. To further such understanding our study applies a social network perspective. The need for such a perspective is advocated in a number of studies (e.g. Long et al., 2013). To ground our study empirically, we conducted our research on knowledge translation networks established within the English NHS under the policy-led initiative of the CLAHRCs. This program was funded by the UK’s major national body for health research and aimed to promote innovation and the translation of research into practice through the development of new, regionally-based, forms of collaborative working across organizations (primarily, universities and hospitals) and specialist groups (clinical practitioners, academic health scientists, social scientists, and healthcare business/management groups). The leading members of these networks were drawn on a seconded basis from a range of universities and healthcare organizations and supported by full-time researchers funded under the initiative. The data presented here are drawn from our study of the knowledge translation work of three of the twelve CLAHRCs funded in the UK.

METHODS

The use of SNA as an analytical tool within healthcare research is still relatively limited (Bunger & Lengnick-Hall, 2018; Valente, 2010). However, there is growing recognition of the effect of social networks on the translation, spread or distribution of knowledge in healthcare settings (Currie & White, 2012; Sibbald et al, 2013; Yousefi-Nooraie et al, 2013). In relation to the UK CLAHRCs, we wanted to know with whom CLAHRC members shared knowledge relevant to their CLAHRC work in order to explore epistemic influences on knowledge translation. SNA was a helpful method in that it could investigate whether the structure of social ties in the knowledge translation network was related to actors' professional discipline, and if so, whether there were differences among disciplinary groups.

Having established cooperation and access with each CLAHRC, we emailed an on-line social network survey to all CLAHRC members. The data yielded from this method allowed us to create a social network of 'nodes' (individuals and professional disciplines) connected by a set of 'ties'. We ran the survey at two time points (T1 in spring 2011 and T2 in autumn 2012). Response rates for the survey across the three sites averaged at 71% (n=261) at Time 1 and 63% (n=211) at Time 2. Social network data is notoriously difficult to collect, so these kind of response rates achieved are usually deemed acceptable (cf. Long et al., 2014).

Social network analysis was conducted using UCINET (Borgatti et al., 2002), with descriptive statistics and graphs in SPSS and Excel. For the purposes of this paper we focus on two measures; the E-I Index (External-Internal Index - Krackhardt and Stern, 1988) and Eigenvector centrality. In brief, the E-I Index was used to measure homophily and heterophily based on the number of knowledge sharing ties that were in-group (homophilous, negative scores) or out-group (heterophilous, positive scores) to a defined group of interest. The eigenvector metric (see Bonacich, 1987, 2007) takes an alternative measure of a node's centrality in a network based on how connected that node is to other well-connected nodes (i.e. degree centrality). In this case, individuals and disciplines as network nodes are 'well-connected' if they span epistemic boundaries or connect to boundary spanners, and hold fewer ties to isolated or peripheral actors.

FINDINGS

To address our first research question, we used the E-I Index routine in the UCINET software package (Borgatti et al., 2002) as a permutation test to analyze the tendency toward homophily or heterophily in the knowledge translation networks of people with either single or multi-disciplinary expertise. Across all three sites, we found that CLAHRC members with single discipline expertise were more likely (compared to multi-disciplinary members) to identify others within their single discipline as important to their knowledge translation network. Conversely, in all three cases, members with multi-disciplinary expertise were found to be more likely to engage with individuals with different single and multi-disciplinary expertise in their knowledge translation work, thus enabling more diverse knowledge sharing interactions. This tendency towards heterophily far exceeded the expected E-I values.

We also found that across all three CLAHRCs academic researchers in general had more homophilous knowledge translation networks than did individuals from either clinical or business backgrounds. That is, academics exchanged knowledge more readily with other academics than with colleagues from outside their discipline (i.e. clinical or business functions), and this homophily tendency exceeded expected levels. These findings suggest that the

epistemic background of individuals does indirectly help to shape knowledge translation activity by influencing the development of informal social networks.

To address our second research question on the boundary-spanning capacity of multi-disciplinary individuals we examined the particular points where actors are positioned to span professional boundaries and the effect of such boundary spanning on knowledge translation for the CLAHRC initiative as a whole. We also focus our attention on academic members of these initiatives, given our finding that academics typically had the most homophilous knowledge sharing networks. Reflecting recent work which has highlighted the epistemic differences between groups (e.g. Currie et al., 2014), we also break down the category of ‘academic’ to reveal differences between social science and health science academics in terms of how members from these disciplines interact with each other, as well as with clinical and business functions.

Our findings show that individuals with multi-disciplinary expertise (linking between disciplines) have the highest eigenvector scores (largest nodes); that is, they are preferentially linked to other well-connected individuals. They also reveal that it is, in fact, social science academics that are the least connected to those outside their discipline - i.e. at an aggregate level social science as a discipline exhibits comparatively more homophily. In contrast, health scientists enjoy a more privileged position because health science is both better connected outside its discipline - i.e. the discipline itself exhibits heterophily - and is also preferentially connected to well-connected others (i.e. to boundary spanners). Importantly, the results show that for these CLAHRCs, social science as an academic discipline, as compared to health science, has fewer knowledge translation exchanges with other professional groups. The implication of this is that, because fewer social scientists are acting as boundary spanners, social science as a discipline holds a peripheral position in the knowledge translation activities of the network. This finding is consistent across all three of our case-studies.

Turning to non-boundary spanning individuals (i.e. those with single-discipline expertise and not sitting between disciplines on the visual graphs), we find that non-boundary spanning social scientists appear as more peripheral than non-boundary spanners from other disciplines because they are less connected to well-connected others in the knowledge translation network (as indicated by small node sizes on the graphs). Our data show that social science academics were, overall, not as favorably positioned for knowledge translation in comparison to those from health sciences. However, when we compare the networks at Time 1 with those at Time 2, we see that some social scientists do begin to move into boundary spanning roles, which creates an interface between this group and other disciplines.

DISCUSSION AND CONCLUSIONS

We identify two important contributions from our research to our understanding of the impact of epistemic differences on knowledge translation activities in healthcare. The first of these is to highlight the indirect effect of epistemic differences on knowledge translation initiatives via their structuring effect on social networks. We found that epistemic differences encouraged homophily in the social ties between individuals. Moreover, our study suggests that this tendency is greater among some groups than others. Thus, academic members of the three CLAHRCs in our study showed a greater propensity to share knowledge with each other than did clinician and business management groups. This reinforces and extends previous studies which have also identified this tendency towards greater inwardness amongst the academic

groups involved in knowledge translation settings (Lockett et al., 2014) study. At the same time, our social network analysis highlights the need to differentiate between distinct epistemic communities within the broad academic grouping – as in our study between health science researchers and social science researchers.

A second contribution of the study is to highlight the boundary-spanning benefits of multi-disciplinary expertise. Here, our finding that individuals with a multi-disciplinary background are more likely to play boundary-spanning roles adds further to understanding of the attributes of individuals in such roles (Waring et al., 2013; Currie et al., 2014). In particular, our study suggests that the individual's ability to transcend epistemic differences, and not merely to develop new social ties, may be vital to the development of effective networks in knowledge translation settings (Boland & Tenkasi, 1995; Dougherty, 1992).

Our study has important implications for policy and practice in relation to the design of knowledge translation initiatives (cf. Fitzgerald & Harvey, 2015). As Mascia et al. (2018) note, in general terms, appropriate formal arrangements or forms of 'knowledge governance' in healthcare can help to encourage knowledge sharing between groups. With respect to our study, in particular, our findings suggests that such initiatives may benefit from incorporating multi-disciplinary individuals in key boundary-spanning roles. This finding reinforces previous work which has highlighted the role of 'trans-specialist knowledge' in enhancing communication and shared understanding in multidisciplinary settings (Cramton, 2001; Mitchell et al., 2017). Our study shows how such individuals enable collaboration and promote interdisciplinary working within a knowledge translation initiative and mitigate tendencies towards homophily at system level. Admittedly, the role of the boundary-spanner is also known to be demanding (Tortoriello & Krackhardt, 2010) and individuals who are members of multiple communities within healthcare may have difficulty participating fully as members in one community if they have allegiances in another (Oborn & Dawson, 2010). Further research is clearly required into the competencies and contexts which may be conducive to such roles.

REFERENCES AVAILABLE FROM THE AUTHORS