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**MANAGEMENT OF SERVICE NETWORKS IN
PRIMARY HEALTH CARE**

APHCRI 2010 TRAVELLING FELLOWSHIP

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1. INTRODUCTION & BACKGROUND

This report details the findings of a literature review and discussions with key researchers in the USA and UK on the use of service network research in primary health care.

Contemporary health care problems associated with ageing related chronic conditions tend to be complex, ongoing and usually multi-factoral. Such conditions often require input from a range of health and social care providers and so service networks as a form of health care delivery has emerged in recent years.^{1,2,3} Understanding service networks, however, is something of a “wicked management problem” given the range of terms that are used, the difficulty in clearly describing what a particular network is composed of (e.g. who is included and who is not) and in attributing cause and effect impact to network activities. Hence, theoretical and methodological work is required to assist managers in the development and maintenance of quality in service networks.

DEFINITION

Network, collaboration and partnership are amongst the terms used to label multi-provider service arrangements that seek compatible goals and coordination of activities. The type of networks that are of concern in this report are ones that are purposively created, goal directed and with the analytic focus generally at the whole network level. Two definitions describe this purposive goal directedness.

Partnership ... a joint working arrangement where partners are otherwise independent bodies cooperating to achieve a common goal; this may involve the creation of new organizational structures or processes to plan and implement a joint program, as well as sharing relevant information, risks and rewards.⁴

The second definition captures the potential benefit, in what has been termed the “collaborative advantage”:

Collaboration – a process through which parties who see different aspects of a problem can explore constructively their differences and search for solutions that go beyond their own limited vision of what is possible.⁶

INVOLVEMENT IN SERVICE PARTNERSHIP RESEARCH

I have been researching service partnerships for a considerable period.⁷ A 2005 qualitative case study of an Aboriginal-mainstream mental health service partnership identified the drivers, linkage processes and sustainability of this partnership program.⁸ In order to move to an empirical basis I commenced a series of studies using social networks analysis (SNA) as described by Provan and colleagues.^{9,10} Some of these studies took a participatory research approach where the data was fed back to managers for assessment of network strength and weakness.^{11,12} The “revelatory” power of this approach was, however, an ethical limitation because of the potential to compromise staff anonymity and confidentiality. Some non-participation and also participant change between time periods did compromise the network description and the longitudinal analysis. Data analysis also had to be adjusted for its clustered

nature. These are limitations that have to be dealt with if the method is to be rigorously applied as a valid health services research process.

More recently, colleagues & I completed an APHCRI funded narrative review on the effectiveness of service linkages in primary mental health care. The review found that the most common factor enabling the development of effective primary health care partnerships was attention to team formation, such as partnership purpose, care protocols and role clarity. These were achieved through progressive “ground up” team discussion built around clinical cases, rather than being driven from above.¹³ This finding resonates with the point made earlier about the nature of “wicked management problems” and also the point made in the Australian Fourth National Mental Health Plan about how to resolve differences between services.³

How such tensions are resolved will depend on the development of local solutions backed by good collaboration between sectors and recognition of roles, responsibilities and limitations. Patients and carers should routinely be involved in such deliberations. p.42

RATIONALE FOR THIS PROJECT

If service partnerships are to be successful then they require the formation of effective participatory evaluation processes that will bring services providers, managers, policy officers and researchers together with a body of information to critically assess partnership development. These participatory approaches are advocated by the National Public Health Partnership in order to develop *better integration of the health problem [and] the knowledge needed for action* (p10).¹⁴ Such participation is proposed as the mechanism through which to improve research uptake into policy and accords with how Lomas describes policy as a process, rather than a product.¹⁵

The purpose of this travelling fellowship was to understand how network analysis is being used in developing health service partnerships and in particular to develop further skills in the use of participatory network analysis approaches.

Objectives

1. Build international links in the application of network research in primary health care.
2. Examine theoretical and methodological issues related to the use of network analysis as a health management quality process to improve service partnerships.
3. Add to the current instructive literature by publishing a paper on the strengths and limitations of network analysis as a health management quality process.

2. METHODS

Two methods were used to conduct the study.

2.1. LITERATURE REVIEW

A review of the literature on the use of network analysis in health management quality processes.

2.2. SITE VISITS

Discussion with international experts on service networks in health and human services.

- *Professor Keith Provan, Eller College of Management and Professor Brint Milward, School of Government & Public Policy, University of Arizona, Tucson, USA.*

Professors Provan and Milward are amongst the most prolific international authors on service networks in public health care organizations. Professor Provan's 2005 award winning paper formed the basis of my work on the use of SNA.

- *Professor Rod Sheaff, Professor of Health & Social Services Research, University of Plymouth, UK.*

Professor Sheaff has an association with the UK National Primary Care Research & Development Centre, where he recently led a team funded by the National Institute for Health Research on *The Management and Effectiveness of Professional and Clinical Networks*.¹⁶

- *Professor Bonnie Sibbald, Dr David Reeves, Professor Anne Rogers & Dr Peter Bower, National Primary Care Research & Development Centre, University of Manchester.*

Discussions related to service linkages in primary mental health care and a new project examining the networks of support used by people with long term conditions. As these discussions were on different topics (albeit related) to the main study focus, these are included as appendix 1.

3. FINDINGS

3.1. NETWORK TYPES

This study is concerned with interorganisational networks that are purposively established and goal directed, as distinct to voluntary social friendship networks. Given this focus, Provan, Fish and Sydow provide the following definition: ⁵

"[An organisational network is] a group of three or more organizations connected in ways that facilitate the achievement of a common goal ... [these are] often formally established and governed and goal directed" p.482

While there are many typologies to define network types, with the organisational network focus the two "whole network" typologies described by Sheaff and colleagues¹⁶ and Milward and Provan¹⁷ are presented. Sheaff and colleagues analysed seven networks in the UK National Health Service using a taxonomy of Southon, Perkins and Galler¹⁸ who categorised health networks on whether function was about care, professional, project, program, experience or interest goals. Milward and Provan drew on their 25 years of network studies to describe four types of public management networks based on the network purpose. These were service implementation, information diffusion, problem solving and community capacity building (see table 1). Of the types described in these two typologies, the category of service implementation network seemed to fit the focus of this study.

While a network may serve multiple functions and not always be categorically distinct, it is useful to have some understanding of the network type in order to be able to manage and evaluate it. Knowing the type of network will help to make judgements about what activities members should be connected, what resources should flow between them, what evaluation indicators to use and what management strategies are required.

Issues related to form and performance of goal directed organisational networks differ from voluntary social networks, such as friendship affiliations, where the perspective is much more about relational embeddedness. While relationships are also a factor in organisational networks, issues to do with goal attainment, which requires network management, is critically important.⁵

Table 1. Public management networks – types and selected characteristics

(abridged from Milward & Provan 2006)¹⁷

Type	Selected characteristics
Service implementation	Used when no one service can meet all of a client's needs. Government withdraws as the service provider and funds a range of services under contract. The horizontal management problem is to achieve joint assembly of services (network structure and processes) and joint production of service (output). Integration of services is a major task. The network has a carrying capacity (e.g. client load) that when exceeded can cause network failure.
Information diffusion	Focus on sharing information to improve response, such as disaster preparedness, research and professional networks.
Problem solving	Extension of information diffusion but that also involves solving a network problem by producing a response structure, such as a disaster command system. Simulation and incident debriefing brings expertise together, builds relationships (trust and reciprocity) and clarifies coordination.
Community capacity building	Goal is to build community social capital so that members can collectively better deal with problems. Requires mapping of community agents involved with the problem with feedback to show network of relationships and gaps. Leads to strategic discussion about strengthening of the network to deal with the problem.

The report of Sheaff and colleagues was highly informative for this study, and so their theoretical framework has been adapted to guide the structure of this report.

Sheaff report framework ¹⁶ (re-ordered)	Framework of this report
Origin	Origin and evolution
Mandate	
Participation	Participation
External links	
Performance	Evaluation
Coordination	Management
Incentives	
Layering	Not covered

3.2. NETWORK ORIGIN AND EVOLUTION

In order to manage a network it helps to understanding how the network started and what was the existing base from which it commenced. Networks can emerge *voluntarily* from among the members, in order to meet member needs such as performing a common function, or be *mandated* from above to serve organisational or policy interests. Provan, Milward and also Sheaff made the same point about network emergence, that over time networks will develop from mixed origins, where successful voluntary networks will eventually be noticed by managers and policy makers, who will then enlist the network as a resource for the attainment of organisational and policy goals.

Whether a network has voluntary or mandated origins will have an impact on the member's motivations for involvement, the goals of the network, the form of governance and also the network structure. For instance, a mandated network might be more likely to have centralised governance and so have a lower number of links between members (lower density) than a voluntary network. Interestingly Sheaff and colleagues found that mandated networks had a higher proportion of managers, with the focus changed from serving members interest to being an implementation process.¹⁶

... networks' response to mandate served to transform an emergent structure serving its founder members' interests into an implementation structure. ... Prior voluntary networks persisted within subsequently mandated networks but as contributing only part – and a decreasing proportion – of the networks' accumulating objectives, activities and artefacts. p. 99-100

While Sandford and Milward¹⁹ suggest that there is no evidence that voluntarily or mandated networks are superior, it has been claimed that highly structured and centralised networks tend to perform better, because with a lower number of linkages they are more efficient in the dissemination of information.^{5,20}

As a different form of organisational structure, networks rely much more on trust and mutual interest amongst members, than do single organisations that can exercise authority and a clear chain of command. Hence, the existence of past relationships is a good predictor of future relationships, as there is a basis for trust in the knowledge that in the past others have pursued shared goals (act with reciprocity). Trust as a relational phenomenon is cumulative and this means that if a mandated network is built on a previous voluntary network then it is less likely to fail.⁵ There is some resonance in this conclusion with my own and colleagues finding from a recent systematic review. We found that partnerships in primary mental health care were formed and sustained through “shop floor” interaction of clinicians in meetings, where over time they developed their care processes, role and goals.²¹ It would be through such “shop floor” interactions that relationships and trust can develop.

System stability is suggested as useful to establish network direction, commitment, known stable rules for interaction and explicit goals and tasks, because these are the basis for reciprocity and trust and prevention of mission drift.^{20,22,23} Over time, however, Milward (*pers com*) suggested that stability without any change can lead to stagnation and so declining performance. While a densely connected set of core members with agreed processes and goals enables the initial attainment of purpose, a lack of external input can eventually inhibit the inclusion of new ideas and hence a lack of responsive change. Redundancy is the term used to describe the links in a network where many members are mutually connected and so repeatedly share the same information across their many mutual connections. Without some minimally

connected peripheral members, who can bring in new information, ideas and resources from the outside, then the network can stagnate. On the one hand, dealing with the difference and lower network commitment of peripheral members can take resources, produce instability and distract network focus from the attainment of purpose. On the other hand without any peripheral discord that goes with new ideas, the network will in the end decline. Hence there is a network paradox, where stability is required for early development, but with later change capacity for flexibility and hence survival.

Related to the concept that networks might change, is the idea that a network might have a life cycle (they might naturally come and go) Sheaff has concluded the following possible cycle (*pers com*):

1. *Emergence: Enthusiasts set up a voluntary network.*
2. *Recognition: Public bodies 'validate' and resource the network.*
3. *Capture: Public bodies try to mandate and manage the network.*
4. *Contestation: Other governance structures start duplicating the network's functions.*
5. *Abolition: Possibly through official de-recognition and loss of membership, leaving either a residual network or none.*

This means that a researcher will want to determine the stage of the cycle of a network. As Sandford & Milward suggest, time is needed for a network to be able to identify, negotiate, manage and monitor its collaborations in order to capture the "collaborative advantage".¹⁹ This would be important to understand before making an evaluative assessment.

3.3. PARTICIPATION

The payoff function

As mentioned above, stability enables trust and reciprocity which facilitates network participation by members. This is because the purpose and commitment of other members can be more reliably anticipated when members have had an ongoing relationship. However, writing on game theory, Ford, Wells and Bailey suggest that because the purpose and commitment of others can never be completely certain, then there is an ever-present potential instability in networks.²⁴

Game theory considers the inter-related nature of decisions in a network, whereby one person's commitment is made in anticipation of others commitment. Where decision-making involves some prediction about the likely decision-making of others then the situation approximates a game. Ford, Wells and Bailey describe the conditions for a cooperative game as follows:

- Every member's motivation is common knowledge.
- Binding agreements exist amongst members in which costs and benefits are specified.
- All benefits from cooperation are returned to the members in the manner that they contribute (i.e. benefits accrue equitably).

As many networks do not meet these criteria then the game theory approach to analysis assumes that the situation is like a non-cooperative game. In order to achieve a level of cooperation for the network to benefit and survive then each member need to consider the *payoff function*. The payoff function is an estimate of the costs and benefits of participating in the network. The general rule is that a member's decision to participate is based on their assessment that they will benefit from the network, at least as much as they would by operating unilaterally. Their decision involves a prediction that others share a mutual purpose and commitment and will also contribute to the network effort.

Ford, Wells and Bailey argue that network analysis can help members to work out their payoff function, because they can then see their network position relative to others. This enables each member to work out their network transaction costs against what they consider to be the benefits of the network to them.

Boundary spanners

Sheaff and colleagues point out that service networks will generally contain representative individuals or sections of larger autonomous organisations. These are the core network participants, who also have links that are outside of this network into their own organisation, which they call the network hinterland. As members of the inter-organisational network and also of their own home organisation, the network participants operate as boundary spanners (conduits) through which resources can flow from their own organisations into the network and vice versa. Hence, the capacity of these representatives within a network will be relevant to the ability of the network to fulfil its purpose. Two aspects are relevant to boundary spanning: first the authority, skills & capacity of the network members to represent and be a conduit for both the network and also their own organisation; and second the commitment of the hinterland of the autonomous organisations to the network, from which the network can draw upon. In other words, network capacity can be related to hinterland support.

Hence, it is important to choose network members (as boundary spanners) wisely, as Sheaff and colleagues state:¹⁶

When networks cannot directly produce their intended objectives but rely on key actors in the 'hinterlands' of their member organisations, it is necessary that the member organisations select as their representatives to networks [individuals as] 'boundary-spanners' with sufficiently high status, power and authority within their 'home' organisation to champion and implement network decisions. p.214

3.4. EVALUATION

Indicators

Collection of network data is only useful if these data can answer the “so what” question, about how a network is performing and how it makes a difference. Hence network variables need to be compared with other indicators of process, impact and outcome. An illustration of a how some of these indicators can be associated are tabulated below.

Table 2. Example of indicators that can be associated for evaluation

Network or actor characteristic	Process (network)	Impact (network)	Outcome (external)
Network			
Total number of links per core relationships vs. other relationships.	Team trust, climate and culture.	Indicators of innovation.	Health service use e.g. reduced emergency department admissions.
Total number of links between types of actors.	Fairness (shared inter-organisational value).	Network development: - Growth of links in core relationships (e.g. increased referrals).	Client health status.
Network density: - Indicates extent of embeddedness and hence diffusion of ideas. Hence, dense networks can be constraining leading to tighter group norms. - As long as all actors are connected, less dense networks can be more efficient, as information travels fewer pathways thereby incurring less transaction costs.	Legitimacy (network actions seen as desirable – critical to the sustainability of the network).	Network performance: - Financial - increased efficiency where product benefits outweigh network transaction costs. - Non financial – increased quality, responsiveness and satisfaction.	
Network centrality: - High centrality facilitates coordination.			
Presence of cliques: - Existence of subgroups and potential differentiation in network. Cunningham and colleagues note that network learning occurs in cliques, that is, through being in proximal relationship with another. ²⁰	Organisational learning.		
Network hierarchy.	Network mandate (voluntary/mandated).		
Actor			
Actor centrality and betweenness scores.	Formal role.		
Actor multiplexity (indicator of multiple relationships).			

Collaborative evaluation

The use of a collaborative approach to network evaluation is one of the key methodological challenges that this study has sought to progress. Feedback of network data can be useful for formative evaluation of network development, particularly as (1) feedback has been found to be a powerful motivator to continued collaboration and (2) to identify actionable points and direction for change.^{5,13,25,26} Lasker, Weiss and Miller describe this formative process thus:⁶

[The challenge is] to conceptualize and measure the proximal outcome of partnership functioning that captures the mechanism that makes collaboration especially effective ... Partnerships need to be able to document how well they are achieving such an outcome to determine if their early efforts are on the right track. p.182

Reflective self-evaluation that is done collaboratively is proposed by Hibbert, Huxman and Smith-Ring as the generalisable process for managing a network:²⁷

... the approach makes a fundamental assumption that collaboration is too complex and idiosyncratic for precise prescriptive remedies. It therefore focuses on providing 'handles for reflective practice'. These are formulated as conceptualizations of collaborative practice which focus the user's attention on aspects of the practice situation that have to be managed, but which expect the user to formulate the managerial action in light of their own circumstances and competencies. p.405

As Cross, Borgatti and Parker have found, simply revealing network diagrams with prompts for discussion readily leads members to identify issues that are hindering the group.²⁵ This can then lead members to make recommendations about how to improve the efficiency and effectiveness of the network. The challenge, however, in this collaborative sharing of network diagrams is the potentially sensitive nature of the information, particularly as individual actors can be identified thereby compromising anonymity and confidentiality. Hence, the approach can be confronting if this is not done carefully, as Cross, Borgatti and Parker describe:

....we pay considerable attention to shaping the questions asked so that they are helpful to the specific issue an organisation is grappling with while at the same time not unnecessarily disruptive to existing relationships. p.28

The potential risks in the use of network data in organisational evaluation and some related counter measures are tabulated below (see table 3).

Table 3. Risks and counter-measures in using network data for organisational evaluation

(adapted from Borgatti and Molina 2005)²⁸

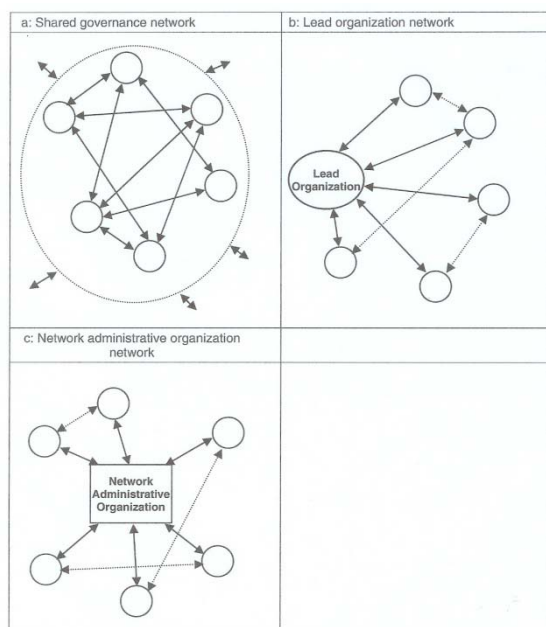
Risk	Detail of risk	Counter-measure	Compromise
Anonymity	Name of actors must be listed on data collection form in order to construct network data.	Show full network data to members only in a facilitated forum but not in this form in the report.	Enables network members to see the complete network map. Anonymity remains compromised but without the information being more widely circulated.
		Various levels of "anonymisation" of actor nodes on diagrams: -Remove names. -Remove any descriptive labelling (e.g. occupation).	Shows overall network structure, but as data on node characteristics is reduced, so does the capacity to diagnose actionable points for change.
	In small organisations actor identify can be implied by attribute and network position.	Do not use diagrams (network maps), but rather aggregate data in summary tables and graphs (e.g. degree centrality histograms).	High level of anonymity that still shows overall network features, but without the capacity to identify specific actionable points for change.
Confidentiality	Collection of data from network members provides information even on those members who do not participate.	Remove data from maps of those members who do not participate thereby providing true full opt out. If using a data collection roster, only list those members who consent to participate.	Confidentiality preserved but network data is incomplete.
	Action is invariably sought to improve the position of actors deemed to be negative to network performance.	Frame network questions about relationships in a way that is non judgemental. Show network data of individual members before this is made public.	Confidentiality remains compromised but can reduce the potential inflammatory nature of the data.
		Establish the use for which network data will be put and make this known as a part of participant recruitment and consent.	Ensures fully informed consent, but if data is mapped this fails to protect anonymity and confidentiality of those who do not consent to participate.
Coercion to participate	Listing of names of network members on a data collection form creates a level of coercion to participate.	Use free recall of those members "networked with" rather than a predefined list.	
Anonymity and Confidentiality	All of the above.	Provide a highly explicit information sheet detailing all potential threats and counter measures to ensure fully informed consent.	Ensures participation is fully informed but may require a long information sheet that may discourage participation.

3.5. NETWORK MANAGEMENT

Models

Given the goal directed nature of service delivery networks it follows that some management (governance) of the network will be needed. Kenis and Provan have described network governance across two dimensions of brokerage and participation.²⁹ In terms of brokerage, at one extreme a non-brokered network can be entirely self-governing with all members equally sharing governance tasks. At the other extreme of brokerage, one agent governs the network. Variants between these two extremes of brokerage would involve the division of governance activities between all or some of the members. In terms of participation, governance may occur through members, either collectively (shared) or through one lead member, or without any member participation, where governance occurs through an outside agent, called a network administrative organisation. Three distinct models are illustrated in the figure below.

Figure 1. Models of network governance (management)



(a) self managed (low brokerage-high participation), (b) one or more lead organisations (medium to high brokerage-low to medium participation), and (c) separate network administrative organisation (high brokerage-low participation).

With increasing service complexity and accountability, models b & c are more efficient and sustainable, if adequately resourced.

Reproduced from Kenis & Provan 2009: p. 447

A shared form of governance would be expected to have a high density and low centrality and hierarchy. As shared governance involves collective decision-making, then this model is optimal when there are few members, where shared participation and commitment by members is crucial, where there is consensus between members about the network goals and where coordination between members is straightforward.¹⁶ While shared governance may be inclusive, it may not be efficient, as decisions require consensus and this can take time. Furthermore there is no spokesperson for the network and the situation could arise where no member takes responsibility for network decisions and actions.

Networks involving a lead organisation or a separate network administrative organisation would be expected to be less dense and with greater centrality and hierarchy. These forms are more effective as the size of network grows, where there is variable commitment to the network from members, and as its coordination activities become more complex (such as conflict resolution, quality monitoring or securing funds).¹⁶ As legitimate administrative burdens grow then a lead organisation could burn out, and so a separate network administrative organisation may be more sustainable. The disadvantages are that domination and power vested in a lead

organisation can cause loss of commitment from other members, and if a separate administrative organisation, then the costs of providing this administrative organisation are seen as taken from service delivery. As a network evolves, then the form of governance can change to suit.

If successful, Sheaff and colleagues claim that management enables a network to become the following:¹⁶

- Complete – by ensuring resources are provided so that the network has the capacity to produce the intended outcomes.
- Effective – by facilitating the required internal structure and external links to ensure the flow of resources.
- Consistent – by providing decision making process to resolve conflict.
- Relevant – by keeping the network focused on its objectives.

Tasks

As distinct from single organisations, where there is a hierarchical chain of command, an interorganisational network is generally made up of autonomous but interdependent organisations. Because these organisations decide to collaborate through a structure that relies more on trust and reciprocity, then this requires a different approach to management tasks, which Milward and Provan describe:¹⁷

The task of network managers is to increase the stock of trust and reciprocity by creating incentives (using resources) and to increase their collaborative skills to build relationships within the network to accomplish network goals. p.10

They identify five network management tasks: accountability; legitimacy; conflict; design and commitment. Design relates to implementation of a management model described above.

Accountability

While a chain of command is often not proscribed, an effective network will still need a process for determining who is responsible for what and how accountability for this will be monitored. Ideally rewards will be applied to those members who contribute and sanctions to those who “free ride”. Sheaff and colleagues list the following three broad functions to achieve this:¹⁶

- Monitoring gaps & deficiencies in core processes.
- Decision making – facilitating collaborative responsibility for output.
- Implementation of decisions.

Legitimacy

Because of the cooperative nature of a network then members need to be convinced that network membership is worth their while. Hence the legitimacy of a network in bringing benefit to the public and the members needs to be continually articulated. Internally, this can involve working with members to support interaction (e.g. meetings) and encouraging them to think and act like a network. Externally this can involve communicating with non-network groups and generating publicity about the network in order to build outside confidence and support.

Conflict

Goals of members invariably differ between each other and may to some degree differ with those of the network overall. Such differences cannot be resolved by command, but rather by cooperative conflict resolution.

Given that the benefit of a network is in the *collaborative advantage*, which is the synergistic benefit that is more than the sum of the parts, it is an important network management function to harness the diversity contained across the members. That is, to make use of the differences as this can lead to innovation. However, differences also bring potential tension and conflict around goals and ways of working. When there is ongoing unresolved conflict then this can undermine trust. Hence network management needs to include processes for recognising and bringing conflict to the surface and also processes for resolving them.

Commitment

Because there will be issues associated with accountability, legitimacy and conflict, then commitment to a network may vary between members and may change over time as they consider the payoff function to them. Sandfort & Milward suggest, as follows, that assessment of the payoff function by members is ongoing, which therefore requires managers to continually negotiate commitment to the network.¹⁹

... many of the dynamics of the collaborative processes are recursive. They do not get established at one time to be forgotten. Instead purpose, membership, trust, power, leadership, and identity all must be negotiated and managed continuously throughout the collaborative process. p. 154-5.

Ford, Wells and Bailey state that one of the first (and often ongoing) assessments that a member will make is whether to join or remain in the network.²⁴ Given that network membership may change, this will further the need for recurring management renegotiation of commitment. The level of this negotiation will vary, from simple celebration of network success (affirm outcomes), to restatement of goals (clarify purpose), through to active problem solving of roles and contribution (work out cost and benefits).

Incentives and drivers

In order to secure member commitment to a network, particularly where this involves some change to the network then a manager will need incentives. Sheaff and colleagues described the following six:¹⁶

- Prudent reciprocity – where members receive and give help in kind to other members– to do this the manager needs to maintain good social relations amongst members.
- Financial – an obvious benefit whereby members gain a tangible resource.
- Appeal to shared values – a moral incentive to participate with others who wish for the same things.
- Technical persuasion/ scientific knowledge – the rational that to participate in the network is the way to achieve beneficial outcomes, because research has demonstrated the proven effect of certain collaborative strategies (e.g. guidelines, clinical pathways).
- Governmentality – through transparently monitoring of contributions, each member can see each other's contribution, thereby facilitating involvement through peer pressure.
- Contracts – enforcing agreed commitment.

It was particularly interesting that Sheaff and colleagues found that it was what networks produced (they call core artefacts) that were the first to change in response to external forces.²³ Hence they concluded that it was what the network does that becomes the driver to further network change, rather than the values that members holds collectively or individually, which they stated as follows:

...practice infrastructure changes modified network sociostructure and cultural superstructure rather than vice versa ... core artefact production [was] the activity driving the development of other aspects of network macroculture. p. 785

One of Sheaff and colleagues key findings was that shared production was the defining characteristic of a network and hence a motivating incentive to change, rather than shared beliefs or values:

We infer that the 'glue' in these networks was not shared 'values' but shared activity, that of producing network artefacts. This explains why, like other studies, ours found that knowledge management (technical persuasion) and authority based upon scientific knowledge embodied in guidelines and formalised clinical pathways was an important medium for network governance. p. 200

Producing practical outcomes (artefacts) based on evidence seemed to be a powerful rationale for action, even in the absence of a shared goal:

... network coordinators [could] use the appeal to scientific validity to depoliticise and depersonalise the decisions and norms which the network promulgated, and so pre-empt or resolve conflicts ... evidence-basing provided the content for many of the artefacts which the networks were mandated to produce i.e. policy advice, material for contracts, project plans and re-designs of services and infrastructures. Even when network members had no shared view of the rationale or goals of the network as a whole, evidence-basing created normative agreement at least about how (if not about why) the network's core process should be undertaken. p. 129-30

They conclude that it is what networks produce that drives other network aspects, with the implication for managers that they state as follows:²³

... that the critical decision in network formation is what core artefacts the network is to produce, and for whom. From this follows the network's espoused values, symbolic artefacts and, eventually basic underlying assumptions. p. 785

4. CONCLUSION

Service networks are important forms of service delivery in health, because many health care problems cannot be solved by autonomous organisations working in isolation. Because networks are different to manage than single organisations, managers need to understand the type and evolutionary origins of the network that they are working with, in order to make appropriate evaluation judgements about network activities and resource flows, as well as the stage at which network outputs should be expected to be greater than the network transaction costs.

While networks can emerge naturally from amongst the members, or be mandated from above, trust and reciprocity are required in order for members to commit to and contribute equitably to the achievement of network goals. It is this requirement that makes networks different to single organisations, where designated line authority and a clear chain of command enable the exercise of management control. In networks, where a member's commitment is based on the anticipated commitment of others, then assessment of the network payoff costs and benefits to each member will be ongoing and network analysis can help to reveal these. Managers need to regularly renegotiate commitment and they can do this by articulating network success (hence benefit), reaffirming or adjusting network goals and through problem solving any issues with member roles and contribution.

Network evaluation to answer the "so what" about network benefit must identify indicators through which network characteristics can be associated with network process and impact variables, and if possible, outcomes for the intended clients of network services. As a process of improving network function, participative evaluation (where data on these indicators is fed back to network members) is proposed as a formative and motivational quality improvement process. Furthermore, with the often idiosyncratic and complex context of a network, participative evaluation (reflective practice) may be the broad generalisable factor in network management. However, such participative processes can be sensitive and involve risks to anonymity and confidentiality, when detail about each member is fed back on a diagram to the whole group. While there are measures to counter these risks, all involve some compromise in terms of loss of explanatory power in the data.

In order for a goal directed network to be complete, effective, consistent and relevant, then it will need an appropriate model of management. With increasing complexity of functions and need for accountability, the most appropriate model will be designation of management function to one or more lead organisation or a separate administrative organisation. While this designation may lead to some loss of commitment, when compared to a self governing network where members participate equally, specific management designation does identify where responsibilities lie. Furthermore, if management functions are separately resourced, then this avoids overload and burnout, thereby supporting sustainability.

To facilitate commitment, management can draw on a range of incentives, both financial and non-financial. To promote network change in response to changes in the environment, a novel finding from Sheaff and colleagues' work in the UK was that a manager should first work on changing what a network does (the network products), and from this the relevant values and underlying assumptions held individually by the members or collectively by the network may change.

POLICY OPTIONS

The following policy options are written with the context of an increasing focus in Australian primary health care on networks; in Hospital and Health Service Networks, Regional Primary Health Care Organisations, and renewed Comprehensive Community Health Centres.

1. **Boundary spanners:** When organisations choose representatives to service networks, then these should be individuals with appropriate status, power and authority to champion the network within their home organisation.
2. **Recurrent management resourcing:** Agencies that fund networks should allocate sufficient recurrent resources for managers to engage in the regular renegotiation of member commitment. While resource requirements will change with network evolution, resources will still be required for both new and established networks in order that they may respond to changes in the environment.
3. **Network monitoring and feedback:** Network managers need to be skilled in and resourced for network monitoring and feedback. This includes understanding of various evaluation methods, such as social network analysis, so that the inevitable differences between individual member goals and network goals can be problem-solved.
4. **Network change:** Agencies that seek to commission or change networked service arrangements should focus on the intended products of the network. There is some evidence that such a focus is the basis for network development, rather than attempting to first establish common underlying assumptions, beliefs and values amongst members, which have been found to be less responsive to change. This will be relevant in networks that bring General Practitioners together with state funded community health services, that have historically operated with different assumptions about health care and different team values.

5. APPENDICES

APPENDIX 1

National Primary Care Research & Development Centre (NPCRDC), UK

The visit to the NPCRDC served two related purposes:

- To meet with Professor Bonnie Sibbald and Dr Peter Bower regarding collaborative models of service delivery in primary care.
- To meet with Professor Anne Rogers and Dr David Reeves regarding the use of ego-centric network analysis to understand the networks of help used by people with long term health conditions.

Collaborative models of service delivery in primary care

Our round 13 APHCRI systematic review of service linkages in primary mental health care concluded that “ground floor” team based problem solving in clinical meetings were a core activity in developing collaborative services.¹³ Both Professor Sibbald and Dr Bower raised questions about the utility and economics of such a model applied across the board, whereby idiosyncratic team responses would need to be worked out in response to individual needs. They proposed that different approaches were needed for the majority of routine patients, whose needs were simpler and different to those whose conditions were more complex. They used the concept of a “hard wired” primary care system that involved setting up evidence based best practice protocols for the majority (the hard wired aspect) but with team problem solving processes (the soft wired aspect) for those with special and complex needs. The soft wired aspect can either be stepped care or stratified care. Stepped care can start with minimal intervention and step up if needed (or vice versa), whereas stratified care involves trying to work out the interventions from the start according to what is needed (stratified to needs). The challenge is to work out which groups of clients need this team-based problem solving approach because, it was suggested:

- Collaborative care is expensive.
- The evidence that it improves health outcomes is equivocal.
- Its success may depend on personalities.

Bower suggested two important components of team based care are: (1) proactive follow up by a case manager who facilitates changes in care if needed; and as a part of this, (2) regular reports (feedback) of outcomes as the motivator to continued collaboration.

Social networks as resource for the management of long-term conditions

Network affiliations are known to be associated with health practices and outcomes.³⁰ In chronic illness, most of peoples’ health care practices take place in their everyday lives outside of the professional health care consultation. Hence network analysis can be used to examine how networks of social relationships influence peoples’ management of their long-term health conditions. Professor Rogers and Dr Reeves are involved in the project “Understanding Networks of Care and Information Needs of People with Long Term Vascular Conditions” (U-NET) funded under the Collaboration for Leadership in Applied Health Research and Care (CLAHRC) for Greater Manchester.

The network method for this application uses an ego centric approach, where the person with the chronic illness identifies those people, groups and services (others) who are important to managing their condition. The inter-relationship between these “others” is measured thereby enabling the helping network for that person to be mapped.

The U-NET project is investigating the types of networks implicated in self care and exploring the manner in which home and work impact on the management of long term conditions. The rationale being that a focus on social networks (& hence social capital) involves a more context related examination of helping resources than if looking only at the skills of individuals. Such a focus may explore the *complex nexus between the role of partner, family and friends, positive and negative types of support, availability of support and acceptability of support, social capital and social debt, stigma and guilt and isolation.*^{Rogers, pers.com} The key questions being asked are the following:

1. How is illness work distributed, negotiated and coordinated within personal networks?
2. Are different types of relationships implicated in different aspects of illness work?
3. What network attributes are associated with professionally focused outcomes (objective health status)?
4. What network attributes are associated with patient-focused outcomes (subjective wellbeing)?
5. Does the existence of particular social networks impact on (health) resource use?

Three hundred and thirty patients with diabetes or coronary heart disease have been recruited through general practice in economically deprived areas of Manchester. These patients have had a 13 dimension postal survey administered followed by a 9 dimension social network interview. Analysis is currently underway, and the following hypotheses are being tested:

1. Higher health outcomes will be associated with:
 - Bigger networks
 - Spouse presence as an identified important network member
 - Larger number of co-habitants
 - Wider range of different types of members in network
 - Denser networks (more interaction between members)
 - Higher positive network member contact and lower negative network member contact
 - Higher face to face contact with network members
 - Higher *illness work* done by network members
 - Higher *other work* done by network members
 - Wider range of different type of work done by network members
 - Higher average level of healthy lifestyle amongst family and friends
2. Higher subjective wellbeing outcomes associated with/ for
 - Bigger networks
 - Less work done by others in friendship dominated networks
 - People who provide support to other network members

Hence, as an approach through which to understand primary health care delivery for chronic illness, future collaboration with the University of Manchester was flagged with a follow up meeting in Adelaide in December with Anne Rogers conducted.

APPENDIX 2

Discussion notes related to network analysis methods

In addition to the nature of networks as forms of health care delivery, the visiting fellowship was used to discuss methodological issue with others using network analysis techniques. The content of these discussions is summarised under the following headings:

- Pragmatics of conducting social network analysis in health services research
- Pragmatics of measurement and analysis
- Utility and use of network analysis

Pragmatics of conducting social network analysis in health services research

Breadth of expertise

As with any rigorous and informative case study work, organisational network analysis usefully draws on a range of knowledge domains for theoretical and methodological insight. Hence research teams benefit from breadth in discipline membership. In the Sheaff et al "Management & Effectiveness" project this included expertise in health services research, organisational theory, social policy, health management, health economics and statistics.

Time

The research work is time intensive, particularly to establish and then collect data. The projects of both Sheaff and Fuller took longer than had been planned for reasons that included the time to define network boundaries and promote survey responses. Fuller used a participatory action research method, which requires time to negotiate participant involvement in the research establishment, and then to deal with issues that were raised by the findings.

Data collection burden

Data collection can be burdensome for both collector and participant. The network concepts need to be unambiguously defined and understood and participants need to recall (and often rate) communication with other network members.

While computerised survey tools can make data collection less burdensome for both participants and researchers, Sheaff & Charles considered that more personal technique through interview survey may improve response rates. In addition Fuller found that survey via interview enabled concurrent qualitative data collection, as participants would often want to add explanation about their communication links.

Boundary specification

Establishing the boundary of the network of interest, akin to determining the population frame in standard social science research, is of critical importance, but yet problematic. The start and end point of a network is generally artificial (unless bound to some ordained criteria like committee membership etc). The network researcher will generally be in a better position after having collected data to know what functional network boundaries to have applied (i.e., who should have been included and excluded). Hence, spending time prior to data collection, to

understand the nature of the network is helpful, as is having helpful “insider” key informants to provide advice about this and also to assist the researcher to enter the field.

An important limitation is that specifying boundaries generally delimits the assessment to include only those who are defined as inside the network, which for mandated public networks may exclude the important and dominant, yet “off stage” policy and funding authority.

An option to pre-defining the network is to allow a few start participants to list those with whom they communicate, and then snowballing out from such lists until participant saturation occurs. This technique is more difficult for participants to recall however and does not appear to be “administer-able” through available computerised survey tools.

Pragmatics of measurement & analysis

Displaying data: maps &/or tables

Displaying data on network maps can provide for visually accessible prompts to interpret network structure. Where networks are highly centralised or dense in links, or where particular members are either highly prominent or isolated, then these features can readily be seen. There is some revelatory power in showing all members and their links on a map, as specific points of network strength and weakness can then be isolated. However there are considerable ethical issues in such a display. Depending on the degree to which nodes on the map are labelled, then anonymity of informants can be compromised, and if data are directed, then the information that they give about others, and that others give about them, is revealed. There are three options available to researchers. The first is to ensure that participants are fully informed, which might, however, increase the chance that members will then not consent to participate. The second is to minimise labelling of nodes to preserve anonymity as much as possible, and so reduce the chance that members will be concerned. The third is to not use maps at all and display the data in summary tables or figures. For instance a histogram of actor degree centrality can show the extent to which a network is centralised, the number of highly connected actors and the distribution of connectivity.

Both Sheaff and Fuller reported that for research purposes tabulating the data were the most useful, as metrics were generated for both cross sectional and longitudinal analyses. However, to manage and develop their own networks, Fuller reported that members found the maps had impact to stimulate action for network change.

Selecting organisational respondents

Provan suggests using more than one respondent per organisation to maximise data capture about organisational linkages, as this information may not be held by one person. Rather than take an average of scores across respondents, the highest score is taken on the assumption that the person most in the know about a linkage will be the one who reports this.

Missing data (non response)

Response rate is a fundamental issue in any social science research, but particularly in network research. Non response in a network means that the network is not fully described and missing is any communication to members from non participants. Sheaff recommends that a desired response rate is 80%.

The following techniques were used to account for non response:

(Sheaff) Imputing the response of a “survey participating” network member to a “survey non-participating” network member. This technique (known as symmetrising the data) was also applied when there were contradictory responses from participating informants, such that if one member reported a link and the other did not, then it was taken that the link did exist. Hence this technique tends to override the use of confirmed links to increase rigor in self reports by accepting as mutual any reported link.

(Fuller) Constructing analysis about network members by using the data that other participating members report (InDegree data). Hence if member D does not participate, it is still possible to generate a score for them by taking what A,B & C report about their links with D. This technique is used for egocentric analysis and does not make up for missing data to improve whole network analysis (sociocentric analysis). However, in egocentric analysis there is some logic in assuming that a summary score of what A,B & C say about D, has less overall self report bias than what D says about their links with A, B & C.

Utility and use of network analysis

Reaction of network members

The utility of network analysis in health services research can be assessed by the reaction of network members to both participate in a network analysis and then how they respond to the findings.

Fuller found in a network study using a participatory action approach that members verified that the maps were an accurate representation of their network. The value of this to them was to promote network problem solving. However, this utility was not straightforward. Both Sheaff and Fuller reported some member concern about participating in a network survey. In Sheaff's case the concern was to do with the *bone fides* of the researchers, that while clarified did result in a lower response from that particular network. While *bone fide* issues may be relevant in any research, the somewhat personalised nature of social network research (*do you communicate with this person, that person and so on?*) may exacerbate such concerns. For Fuller, some members declined to participate in the network survey because of the anonymity concerns, and instead chose to participate in focus group discussions to provide their input about the network. However, in this study members did indicate that they found the network maps were useful.

In terms of use, Fuller's study took an action research approach whereby the findings were fed back to network members, so that they could take action, based on what they considered were their network strengths and weaknesses. The assumption being tested, in two case study sites, was that the members would use the network data to strengthen their network. While not expected during the research planning, but in hindsight now might have been anticipated, some members did evaluate the value of the network to them, but about whether it was worth staying in the network. In game theory, this is called the payoff function, about which Ford, Wells & Bailey make the following relevant point:²⁴

The first part of such an evaluation is whether they want to continue participating in the network ... these calculations are based on estimations of both individual costs and distribution of collective benefits. p. 169

In terms of utility, network analysis does make visible what may otherwise have been invisible.²⁵ Hence, the issues of the network may seem to get worse before there is improvement. What this does mean for the researchers, as is the case with any action research,

is the need to remain engaged with the research field to help deal with the issues that are raised.

Additional contextual information

In keeping with the reaction of network members described above, both Sheaff and Fuller found a desire from network members to explain why their network was the way it was, as the maps had revealed. This was not surprising and also welcome, given that network analysis shows structure but does not provide the reasons for that structure. Hence, a researcher should expect to collect such data from members who will want to provide it and these data will invariably be qualitative.

APPENDIX 3

Itinerary

17/9/10	Sydney	Presentation at THEMHS Australian Conference
20/9/10	Tucson, USA	Attend network analysis seminar with Professor Keith Proven
		Meet with Dr Jeffrey Burgess, Director Division of Community Environment & Policy, College of Public Health, University of Arizona
		1 st meeting with Professor Keith Proven, Eller College of Management, University of Arizona
21/9/10		Meeting with Professor Judith Effken, School of Nursing, University of Arizona
		Meeting with Professor Brint Milward, School of Government & Public Policy, University of Arizona
22/9/10		Meeting with Dr Jennifer Peters, College of Public Health, University of Arizona
		Give seminar at College of Nursing, University of Arizona
		Meeting with Dr Howard Eng, Arizona Office of Rural Health
		Meeting with Alison Hughes, Director, Arizona Office of Rural Health
23/9/10		Meeting with Dr Kevin Driesen, Director Arizona Rural Hospitals Flexibility Program
		Give seminar to Arizona Office of Rural Health
		Meeting with Agnes Attakai, Indigenous Program Director, Arizona Office of Rural Health
24/9/10		Desk work, College of Public Health, University of Arizona
26/9/10		2 nd meeting with Professor Keith Proven, School of Management, University of Arizona
27/9/10	transit	USA to UK
28/9/10	transit	London to Plymouth
29/9/10	Plymouth UK	1 st Meeting with Dr Rod Sheaff, Professor of Health Service Research, University of Plymouth
		Meeting with Nigel Charles, Research Associate, University of Plymouth
30/9/10		Desk work – University of Plymouth - continue review of report for discussion
1/10/10		Desk work – University of Plymouth - continue review of report for discussion
4/10/10		2 nd Meeting & lunch with Dr Rod Sheaff
5/10/10	transit	Plymouth to Manchester
6/10/10	Manchester UK	Meeting Dr David Reeves, National PHC Research & Development Centre, University of Manchester
7/10/10		Meeting & Lunch with Professor Bonnie Sibbald, Director National PHC Research & Development Centre, University of Manchester
		Seminar with social network group, National PHC Research & Development Centre, University of Manchester
8/10/10		Meeting with Professor Anne Rogers, National PHC Research & Development Centre, University of Manchester
11/10/10		Meeting with Dr Peter Bower, National PHC Research & Development Centre, University of Manchester
12/10/10		Give seminar at National PHC Research & Development Centre, University of Manchester

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