Strategic Clinical Network Teams Improve Effectiveness, Team and Leadership Processes and Inputs: Theory-Based Longitudinal Survey

Deborah E. White, Jill M. Norris, Danielle A. Southern, Tracy Wasylak and William A. Ghali

Abstract

Strategic Clinical Networks (SCNs) in Alberta include multidisciplinary teams that work toward health system innovation and improvement; however, what contributes to team effectiveness is unclear. This theory-informed longitudinal survey (*n* = 826) evaluated team effectiveness within SCNs and predictors of effectiveness. Satisfaction, inter-team relationships and seven predictors including team inputs and team and leadership processes improved over two years. Attitudinal outputs were predicted by the same factors over time, whereas performance outputs were predicted by different factors. This innovative study emphasizes that SCN teams and their effectiveness evolve over time and that team-based research can refine network evaluations.

Background

In 2012, Alberta took a bold step to overhaul its governance for quality and safety by establishing Strategic Clinical Networks (SCNs) as a means to address system-wide challenges in specific areas of healthcare (Yiu et al. 2019). SCN-like networks were established over 20 years ago in Australia and the UK, and others have been created more recently, internationally, and in British Columbia. These networks intend to improve quality of care through a systems-level approach to change and typically focus on operational areas, populations, clinical areas, conditions or interventions (McInnes et al. 2012; Spencer et al. 2013).

Following a recent network restructuring in 2020–2021, there are 11 SCNs and five Provincial Integrated Programs in Alberta, currently. Collectively, these are *multidisciplinary teams* that bring stakeholders and health partners together – including front-line staff, clinical and operational leaders, the public and external partners – to co-design, rapidly test and implement evidence-based improvement strategies across the provincial health system (Noseworthy et al. 2015). Each SCN is designed with a leadership team, a core committee and multiple working groups, along with a pan-SCN executive committee, which all work toward setting priorities and directing the activities of the networks. While rigorous evaluations of networks have identified that credible and visionary leadership, strong strategic and operational management, stakeholder engagement, network structure and effective communication are critical characteristics for network success (Brown et al. 2016; Haines et al. 2018), little is known about the dynamics between network leaders and the groups/teams they lead over time and the interactions or processes within these teams that actually make a difference to team goals.

Organizational team science is well developed and has been applied to networks (Park et al. 2020), systems (Harvey et al. 2019) and within healthcare and quality improvement (Schmutz et al. 2019; White et al. 2011). One dominant theoretical approach to understanding teams is the input–process–output

team effectiveness model (Mathieu et al. 2008; McGrath 1964). Inputs are the antecedent factors that influence how team members interact while working toward accomplishing tasks, including the characteristics of individual team members (e.g., competencies), team factors (e.g., design of the task) and the contextual and organizational factors, such as resources and climate. Team processes, or how team members interact, include factors such as clear and specific goals and objectives, participation in decision making and leadership. Team outputs result from team inputs and processes and include both tangible performance (e.g., innovations, effectiveness) and the attitudinal reactions of team members (e.g., satisfaction, attachment; Mathieu et al. 2019).

The aims of this survey study were to evaluate the effectiveness of teams within SCNs and predict team effectiveness using theory-based factors over time. We anticipated that SCNs' teams would change over time as would the factors that predict effectiveness. This work was part of a larger mixed-methods arm's-length evaluation of the SCNs in Alberta, including descriptions of the governance structure (White et al. 2019b) and stakeholder engagement (Norris et al. 2017a, 2017b; White et al. 2019a).

Methods

Using a prospective longitudinal survey design, data were collected with a two-year interval from February to May 2016 (Time 1) and June to August 2018 (Time 2), given perceptions about the time required to see an impact from the SCNs (Wasylak et al. 2019). In consultation with the study knowledge users, nine of the 13 SCNs that existed at the time of the study were purposively selected as they exhibited a range of maturity (i.e., the length of time established) and had either implemented or completed projects. The most mature SCNs were Bone and Joint Health; Cardiovascular Health and Stroke; and Seniors Health (now Seniors and Continuing Care Integrated Provincial Program) SCNs as they were operating in a network structure established before 2012. Cancer; Diabetes, Obesity and Nutrition; and Surgery SCNs were of medium maturity, having been established in 2012–2013 and with large-scale projects that were implemented provincially. Addiction and Mental Health; Critical Care; and Emergency SCNs had been established for the least amount of time and had early-stage projects without funding for priority work. Members were identified from SCN contact lists (core committee, working groups) that included information on their role in the SCN (e.g., clinician, co-executive leader, zone lead, executive director, working group member). Recruitment occurred first through presentations during SCN meetings, followed by personalized e-mails to members. Individuals were eligible to participate if they were an English-speaking member on either the SCN core team or working group, with access

to the internet and a computer. We adhered to online survey principles to facilitate higher response rates, including the option to complete a paper-based survey, a simple and usable design and follow-up reminder e-mails and phone calls at two- and four-week intervals (Dillman et al. 2008). We anticipated that each SCN would have 100 members across the core team and working groups for a maximum of 900 members. Given previous response rates within clinical networks (Haines et al. 2018; Norris et al. 2017a), we anticipated a conservative survey response rate of 25% (225 participants).

Data collection

Demographic and confounding factors
Participant information on SCN affiliation, gender, age, Alberta Health Services (AHS) geographical zone, professional designation, years working for AHS, years of professional experience and SCN role were collected. Each of the nine SCNs were categorized as having low maturity, medium maturity or high maturity, with three SCNs in each category.

Team effectiveness: Team inputs, team processes, leadership processes and team outputs
The Aston Team Performance Inventory (ATPI) was used to measure the theory-based constructs of team effectiveness of the network teams (Dawson et al. 2006). Table 1 details the elements and dimensions of the ATPI. Dependent variables were assessed via the five team output subscales: Team Member Satisfaction, Attachment and Performance, Team Effectiveness, Inter-team Relationships and Team Innovation. Independent variables were assessed from 13 subscales that include team inputs (task design, team effort and skills, organizational support, resources), team processes (objectives, reflexivity, participation, task focus, team conflict, creativity and innovation) and leadership processes (leading, managing and coaching). This tool consists of 100 items rated on a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*); items form numeric subscales. The ATPI has been used in various healthcare settings (Dixon and Wellsteed 2019; Taylor et al. 2010; West et al. 2012) with acceptable reliability (Cronbach's α =.66–.94 for subscales).

Statistical analysis
All data were anonymized before analysis. We compared patient characteristics and team elements for the two time periods. Chi-squared and t-tests were used for comparisons of the time periods, where appropriate. Each team subscale was then analyzed separately with a one-way analysis of variance, using a mixed-effects model and adjusting for within- and between-respondent variability. Five separate backward stepwise regression models were performed to assess relationships between

TABLE 1.
Elements and corresponding subscales of the Aston Team Performance Inventory

Element	Dimension	Components	Items (n)
Team input	Task design	Interdependence, feedback, task relevance, autonomy, tasks	11
	Team effort and skills	Team member motivation, appropriateness of skills, team potency	8
	Organizational support	Information and communication, training, climate for team working	11
	Resources	Resources for the team	4
Team processes	Objectives	Clarity, agreement about objectives, commitment to objectives	3
	Reflexivity	Reflection on performance	4
	Participation	Trust, safety and support, decision making, communication, regular meetings	7
	Task focus	Customer focus, constructive debates about task performance, concern with quality, error management	6
	Team conflict	Task-related conflicts, interpersonal conflicts	5
	Creativity and innovation	Practical support for new and improved products and services, climate for creativity and innovation	3
Leadership processes	Leading	Acquiring resources, setting direction, supporting innovation	4
	Managing	Guiding the team toward effective processes, monitoring performance, encouraging inter-team working, recognizing and rewarding, giving helpful feedback	8
	Coaching	Encouraging learning from error, being available, showing concern for individual members, providing encouragement and support	5
Team outputs	Team member satisfaction	Being recognized for their contributions, individual responsibility on the team, having team member support, having team openness, having influence over decisions and how conflicts are resolved	6
	Attachment	Attachment to the team and its members	3
	Team effectiveness	Managerial praise, goal achievement	3
	Inter-team relationships	Lack of conflict, cooperation with other teams	5
	Team innovation	Development of new products, services or ways of working	4

each dependent survey measure and the independent construct of team cohesion assessed in the survey. Each model yielded correlation coefficients, adjusted for potential confounders (participant demographics, SCN maturity and SCN type) through a backward stepwise selection process, removing variables that had non-significant p values ($p > 0.05$). SAS 9.2 (Cary, NC) was used for analyses.

Ethical considerations

The University of Calgary Conjoint Health Research Ethics Board granted ethics approval (REB13-0783/0781). Submitting the online survey implied informed consent. Participants had unique identifiers, and their characteristics were aggregated to ensure anonymity.

Results

Descriptive characteristics of a sample

A total of 357 of 1,147 eligible network members participated at Time 1 (31% response rate), and 469 of 1,317 members participated at Time 2 (36% response rate). Participant characteristics are detailed in Table 2. Respondents were predominantly female (68.4%), were aged 40–60 years (67.2%), had more than 20 years of experience (65.6%) and were from the two urban regions in Alberta (Calgary and Edmonton, 74.5%). Of note is that more respondents were leaders in Time 1 (52.7%) compared to Time 2 (39.9%, $p < 0.0006$).

Participant characteristics and team elements at Time 1 and Time 2

Characteristic		Time 1 (n = 357)		Time 2 (n = 469)		
		n	**Percentage**	**n**	**%**	**p value***
Gender	Male	113	31.7	135	28.8	0.0006
	Female	244	68.4	326	69.5	
	Other	0	0.0	8	1.7	
Age	18–29 years	12	3.4	4	0.9	0.016
	30–39 years	46	12.9	74	15.8	
	40–49 years	96	26.9	152	32.4	
	50–59 years	144	40.3	165	35.2	
	60+ years	57	16.0	66	14.1	
	Unknown	2	0.6	8	1.7	
Years of experience	0–9 years	37	10.4	42	9.0	0.31
	10–19 years	79	22.1	111	23.7	
	20+ years	234	65.6	298	63.5	
	Not applicable	7	2.0	18	3.8	
Years in AHS	0–9 years	90	25.2	103	22.0	0.33
	10–19 years	99	27.7	133	28.4	
	20+ years	84	23.5	134	28.6	
	Unknown	84	23.5	99	21.1	
SCN role	Leader	188	52.7	187	39.9	0.0006
	Non-leader	168	47.1	282	60.1	
	Unknown	1	0.3	0	0.0	
AHS zone	Calgary	161	45.1	190	40.5	0.011
	Edmonton	105	29.4	151	32.2	
	Central	47	13.2	38	8.1	
	South	26	7.3	41	8.7	
	North	17	4.8	43	9.2	
	Unknown	1	0.3	6	1.3	
Team element		**M**	**SD**	**M**	**SD**	**p value§**
Team inputs	Task design	2.88	0.61	3.39	0.50	0.003
	Team effort and skills	3.00	0.60	3.30	0.56	0.08
	Organizational support	2.79	0.78	3.05	0.49	0.20
	Resources	2.33	0.64	2.95	0.49	0.0006
Team processes	Objectives	3.50	0.84	3.91	0.53	0.06
	Reflexivity	3.04	0.69	3.36	0.66	0.11
	Participation	2.90	0.87	3.64	0.58	0.001
	Task focus	3.00	0.83	3.50	0.67	0.031
	Team conflict	3.21	0.72	3.64	0.67	0.07
	Creativity and innovation	3.24	0.93	3.77	0.66	0.10

Team element		Time 1 (n = 357)		Time 2 (n = 469)		
		M	SD	M	SD	p value[§]
Leadership processes	Leading	3.16	0.80	3.95	0.53	0.004
	Managing	3.28	0.79	3.77	0.57	0.002
	Coaching	3.28	0.98	3.91	0.62	0.048
Team outputs	Team member satisfaction	3.27	0.87	3.46	0.83	0.004
	Attachment	3.41	1.02	3.53	0.89	0.13
	Team effectiveness	3.12	0.92	3.23	0.83	0.10
	Inter-team relationships	2.89	0.76	3.09	0.73	0.001
	Team innovation	3.36	0.90	3.49	0.85	0.06

*chi-square test; [§]t-test.

ASH = Alberta Health Services; M = mean; SCN = Strategic Clinical Network; SD = standard deviation.

Differences over time

Table 2 details the mean, standard deviation and p value in differences in domains over time. Mean scores ranged between 2.33 and 3.50 at Time 1 and 2.95 and 3.95 at Time 2. Small improvements over time were observed for scores of two team outputs, namely, team member satisfaction (3.8%) and inter-team relationships (4.0%). Seven factors from team inputs, team processes and leadership processes significantly improved over time: task design (10.2%), resources (12.4%), participation (14.8%), task focus (10.0%), leading (15.8%), managing (9.8%) and coaching (12.6%).

Predictors of team effectiveness

Table 3 displays models for each output at Times 1 and 2. All models were significant and accounted for 34–70% of the variance in outputs (adjusted R^2), and the coefficients of significant predictors ranged in value from 0.21 to 0.56 ($p < 0.001$). Of note is that organizational support, resources, reflexivity and task focus were not predictive of any output at either time, nor were potential covariates (including maturity). Both the attitudinal outputs – team member satisfaction and attachment – were predicted by the same factors at Times 1 and 2, including objectives and participation. Satisfaction was also predicted by coaching at both times. All three of the performance outputs – team effectiveness, inter-team relationships and team innovation – were predicted by different factors over time. Team effectiveness was predicted by participation and managing at Time 1, while team effort and skills and leading were predictive at Time 2. Inter-team relationships were predicted by task design, team conflict and coaching at Time 1; team effort and skills and leading were predictive at Time 2. For team innovation, team effort and skills, creativity and innovation and coaching were predictive at Time 1; creativity and innovation and coaching were predictive at Time 2.

Discussion

The aim of this study was to evaluate the effectiveness of teams within SCNs over time using a comprehensive and well-established theoretical framework. As one of the first quantitative longitudinal studies on SCNs, it is also novel in its evaluation of team and leadership processes (or behaviours) as an extension of the predominantly structural view of healthcare networks and its examination of multiple forms of effectiveness. Over two years, significant improvements were observed for the outputs team member satisfaction and inter-team relationships, as well as for seven input and process factors. Predictive models for each of the five team outputs were significant. Attitudinal outputs were predicted by the same factors over times, whereas performance outputs were predicted by different factors over time.

It may not be surprising that the predictors of the attitudinal or emotional atmosphere of the team remained stable; trust, safety, support, communication, clarity and commitment could be considered the universal principles for feelings of belonging and gratification within a group. These defining features of the team processes, *objectives* and *participation*, have been widely reported as important for successful stakeholder engagement and for the effectiveness of SCNs overall (Brown et al. 2016; Norris et al. 2017b). Moreover, there is meta-analytic support for these types of relationships with the affective outcomes of organizations (Mathieu et al. 2019). Unlike the attitudinal outputs, predictors for performance outputs differed over time. Regardless of the output – innovation, team effectiveness or inter-team relationships – at some point, it was important as to who was on the team and how leaders interacted with members, and what the specific targeted team processes were. These findings encourage SCNs to focus on the interactions between SCN members to create improvements in their performance in addition to having the right people on the team and leadership, which are often described as key driving

TABLE 3.
Variables associated with team outputs

Predictors	Team member satisfaction		Attachment		Team effectiveness		Inter-team relationships		Team innovation	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Task design							0.31*			
Team effort and skills						0.46*		0.38*	0.24*	
Objectives	0.24*	0.36*	0.36*	0.42*						
Participation	0.46*	0.42*	0.56*	0.47*	0.41*					
Team conflict							0.25*			
Creativity and innovation									0.43*	0.51*
Leading						0.29*		0.31*		
Managing					0.32*					
Coaching	0.24*	0.21*					0.25*		0.25*	0.33*
R^2	0.67	0.70	0.50	0.51	0.41	0.34	0.39	0.38	0.54	0.52
F	423*	244*	324*	168*	213*	79*	133*	94*	246*	174*
df	3	3	2	2	2	2	3	2	3	2

df = degrees of freedom; F = f statistic; R^2 = coefficient of determination; T1 = Time 1; T2 = Time 2.
* $p < 0.001$.

factors of SCNs (Brown et al. 2016; Glegg et al. 2019; Manns and Wasylak 2019).

Along with qualitative descriptions of strong, committed and visionary leaders, the *structure* of leadership – such as formalized leader or manager roles, number of meetings, proportion of full-time equivalent or reporting/account-ability configurations – has been the main focus in the SCN literature, which may be attributed to the emphasis of the broader network literature on social structures (e.g., Bae et al. 2015; Glegg et al. 2019). Our results suggest that leadership *behaviours* differentially influence the outputs of SCN teams over time, which is supported by reviews from management (Koeslag-Kreunen et al. 2018; Lorinkova et al. 2013; Morgeson et al. 2010). Coaching – defined as the encouragement, support, availability and concern for members – was a predictor of satisfaction and innovation at both times and inter-team relationships at Time 1. Managing only predicted effectiveness at Time 1, and leading predicted effectiveness and inter-team relationships at Time 2. Leadership processes that are directive or task-focused (such as managing) may benefit teams in early stages of development, whereas empowering or person-focused processes (such as encouragement and support) influence team performance in the long term (Lorinkova et al. 2013).

In stark contrast with most network literature (e.g., Brown et al. 2016; McInnes et al. 2015; McKinlay et al. 2020), resources and organizational support did not predict any output, though resources did improve over time. While this result may be indicative of our small study size or team focus, it is intriguing to consider that despite qualitative perceptions to the contrary, more resources does not necessarily ensure success within the networks, a hopeful notion for resource-limited contexts.

Overall, SCNs in Alberta are evolving over time as evidenced by improvements across team inputs, processes and outputs. Substantial investments have been made within the Alberta SCNs for leadership development, mechanisms to improve stakeholder engagement across the province and learning and information sharing, among many other initiatives, and SCN leadership recently reported a positive return on investment and cost savings in the health system, which are important team outcomes (Wasylak et al. 2019; Yiu et al. 2019). Although the SCN teams are improving, "maturity" (operationalized as months since the larger SCN had been established) was not predictive of any team output. We posit that SCN maturity is a proxy for more well-established structures and processes established over time or denoted an undefined stage of develop-ment. In their clinical network evaluation framework, Carswell et al. (2014) offered three stages of network development: partner selection (i.e., ensure compatibility, commitment and complementarity), network design (i.e., facilitate engagement and alignment of key members to support network purpose)

and network management (i.e., develop trust and coordination among members).

While we agree with a developmental approach to evaluating SCNs and further study of developmental stages of networks, it is important to consider that teams within a single network may be in very different stages of development. Indeed, SCNs could be described as complex *multi-team systems*, whereby "teams within teams" coordinate efforts toward achieving goals beyond a single team's goals (Mathieu et al. 2018). SCN team leaders and decision makers may benefit from the theoretical refinements that the multi-team-system literature offers as this discipline merges work teams with networks. SCN researchers have many potential avenues of investigation with a multi-team-system lens, including member churn, temporal dynamics, advantages of including members who are part of multiple teams, relational dynamics, prior social network connections or similarities/differences in team structures within the network (Park et al. 2020).

This study has several limitations. We conducted this study in a single health system in Canada, limiting the generalizability of study findings; however, we included nine networks with varied foci. Our sample included SCN members who self-selected themselves to participate in the study, which may have led to significant selection bias, and we were unable to compare responders to non-responders. We also acknowledge that the self-reported nature of surveys may have introduced response bias. The survey response rate was similar to that in other studies on clinical networks (Haines et al. 2018). Recent advances in network research include expert ratings of diverse network outcomes (Dominello et al. 2018), rather than the subjective perceptions of effectiveness and performance from network members. Our original intent was to include measures of clinical outcomes, but the process was more complex and problematic to achieve than anticipated. Lastly, although it might be interesting to study different models for the demographics, with multiple levels of the demographics, we chose not to present multiple models over presenting a model for our entire dataset. Stratification can attenuate multicollinearity among covariates, so we have chosen not to stratify our analyses. There may be some relationships that may be stronger for different characteristics of the SCNs.

Conclusion

SCN-like networks have been established in many health systems as a structural solution to improving collaboration among healthcare stakeholders within and external to the healthcare system. In this innovative study, SCN teams improved the satisfaction of team members and relationships between teams over two years, as well as inputs and processes including the design of tasks, resources, participation, task focus and the behaviours of leaders. We addressed a gap in understanding team and leadership processes within networks and how those processes influence the achievement of varying team goals over time. Future research could explore behavioural interventions targeted toward improving the interactions of SCN team leaders and members, as well as further refine interactions between SCN teams and important stakeholders. HQ

Declaration
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About the Authors

Deborah E. White, PhD, RN, is dean and professor at the University of Calgary in Qatar, Doha. She can be reached by e-mail at dwhit@ucalgary.edu.qa.

Jill M. Norris, MSc, is a private consultant in Calgary, AB.

Danielle A. Southern, MSc, is a senior research associate at the Centre for Health Informatics at the University of Calgary in Calgary, AB.

Tracy Wasylak, BN, MSc, CHE, is the chief program officer of Strategic Clinical Networks, Alberta Health Services, and adjunct professor in the Faculty of Nursing, University of Calgary in Calgary, AB.

William A. Ghali, MD, MPH, is vice president (research) at the University of Calgary in Calgary, AB.