

Clinical networks: enablers of health system change

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In 2014, the federal Advisory Panel on Healthcare Innovation highlighted an urgent need for fundamental changes in how health care is organized, financed and delivered across Canada.¹ The panel noted examples of innovations affecting health outcomes within specific areas of health in some provinces, but also a general failure to scale up successful pilots provincially.

Variation in care is common across health systems, but gaps in care and issues with access, wait times, equity and efficiency have been highlighted as particularly problematic in Canada.² Clinical networks, embedded within a supportive health system, have been proposed as a way to address key health system problems as they can identify the reasons for gaps in care, and work collaboratively with clinicians and operational leaders to design, implement and evaluate strategies to increase evidence-based practice.³

England, Scotland and Australia have implemented system-wide formal clinical networks across their health systems, although these networks have varied in composition, target areas, structure and processes. Within Canada, Alberta has established province-wide clinical networks and British Columbia recently implemented such entities to improve care in two distinct clinical domains. We consider evidence of the effect of clinical networks, and discuss potential barriers and enablers of such networks to inform strengthening of health systems in Canada.

What are clinical networks?

Clinical networks have been defined as “networks of clinicians and consumers that aim to improve clinical care and service delivery using a collegial approach to agree on and implement a range of strategies.”⁴ A systematic review of clinical networks in 2016 identified 22 studies that assessed the impact of clinical networks in 7 countries.³ We used this as a starting point to determine which regions or countries were supporting system-wide clinical networks.

The characteristics of clinical networks in England, Scotland, New South Wales (Australia) and Alberta (Canada) are summarized in tables below. The accuracy of the data therein was confirmed with experts in each jurisdiction.

England and Scotland have seen an evolution in their clinical networks over time. Until 2000, in Scotland, the clinical networks were generally voluntary, but eventually became mandated, at

KEY POINTS

- The federal Advisory Panel on Healthcare Innovation noted the importance of innovation in health care and that most health care systems lack the ability to scale and spread innovation.
- Some health systems have created system-wide clinical networks that identify priorities, explore solutions and implement strategies to improve care and outcomes.
- Early evaluations suggest that clinical networks can improve care processes and enable system-wide change.
- Successful networks have effective leadership, partnerships and communication; are embedded within the health system; operate with adequate resources; and strategically align projects.

least for certain conditions (diabetes, cardiovascular disease and cancer). Similarly, in England, many managed clinical networks were put in place in the late 1990s, but since 2013, national mandated networks in cardiovascular; maternity and children; cancer; and mental health, dementia and neurologic conditions have been prioritized.⁵ Given budget constraints and these stated priorities, since 2013, there has been less financial support in England for the other managed clinical networks, although some networks continue to exist in other areas, such as diabetes and end-of-life care.

In all 4 jurisdictions, clinical networks have varied in their content areas and makeup, initially starting as clinically focused networks with variable involvement of policy-makers and patients; all now mandate the involvement of patients and carers across networks. Their leadership and accountability structures have also differed (with most networks having accountability through the health system). Finally, they vary in terms of available resources and processes.

What is the rationale for clinical networks?

Although the stated goals of clinical networks differ, in general they are used as a mechanism to prioritize areas for health system change, identify and help implement strategies to promote evidence-based practice, and improve appropriateness

of care and outcomes. Usually such networks are tasked with tackling problems that require complex change among many groups and organizations. Networks have been offered as an alternative to health system change being driven solely from the top down, which can be said to affect clinician engagement and innovation negatively.⁷ However, an exclusive bottom-up approach might lack strategic planning, and may not lead to alignment and collaboration with operations. Therefore, a combined top-down and bottom-up approach to the design of clinical networks has been suggested.⁴ Scotland has the longest-established clinical networks, all of which operate according to a set of defined principles, ensuring they meet certain goals.⁸

What has been the impact of clinical networks internationally?

A systematic review of the impact of clinical networks in 2016 identified 9 quantitative and 13 qualitative studies.³ All quantitative studies were of low to moderate quality and generally reported on measures of health service delivery, with only

2 studies reporting clinical outcomes. Six studies were conducted in England (2 moderate-quality studies), Scotland (1 low-quality and 1 moderate-quality study), and New South Wales, Australia (1 low-quality and 1 moderate-quality study).

England

The systematic review included 1 observational, before-and-after study evaluating the impact of a national reorganization of neonatal services in England into managed clinical neonatal networks to improve access. This led to an increase in the proportion of preterm babies born at hospitals providing the highest volume of specialist care (18% to 49%; $p < 0.001$).⁹ The second study (an observational cross-sectional study) evaluated a diabetes managed clinical network and noted statistically significant improvements in multiple process indicators, including glycosylated hemoglobin; blood pressure; and foot, neurologic and retinal screening.¹⁰

Information on some of England's strategic network initiatives is summarized in Table 1. Not all clinical networks have been successful in England, including some early examples of

Table 1: Characteristics of a selection of clinical networks that have existed in England*^{5,11}

Network purpose	Members	Leadership structure	Processes
Clinical genetics network (initiated in 2001): <ul style="list-style-type: none"> To develop national policy on genetics and transition into public health and policy To transition genetics research into practice To support a network in human genetics 	<ul style="list-style-type: none"> Largely university based Included a core stakeholder group of 24 people, including clinical scientists, health care providers, patient groups and ethical and legal experts 	<ul style="list-style-type: none"> Has a network director, reporting to a supervisory board made up of the Department of Health and Social Care and Department for International Trade, as well as research and hospital trusts 	<ul style="list-style-type: none"> Embedded in translational science, the network translates evidence from genetics research into national policy, clinical practice and education for the public and patients
Managed cancer networks (initiated in 2000): <ul style="list-style-type: none"> To implement national policy and evidence-based cancer guidelines locally To improve patients' journeys through the health system 	<ul style="list-style-type: none"> Each managed cancer network is composed mainly of clinicians, with some patient representation 	<ul style="list-style-type: none"> National cancer director (a respected clinical academic) 34 local managed cancer networks, generally led by a chief executive officer, a medical and nursing director and a service improvement lead Organized into multidisciplinary tumour groups reporting to a national network management team 	<ul style="list-style-type: none"> Individual tumour groups review service improvements, monitor data on wait times and outcomes and are responsible for joint protocols, guidelines, education and care pathways
Sexual health networks (initiated in 2001): <ul style="list-style-type: none"> To implement national guidelines on sexual health locally, including improved response to and care for HIV/AIDS To reduce teen pregnancy rates 	<ul style="list-style-type: none"> The membership of sexual health networks varied and included members from hospitals, clinicians, voluntary sector, patient representatives from the NHS Sexual and Reproductive Health services, and other professional organizations 	<ul style="list-style-type: none"> Sexual health networks were accountable to primary care clinical commissioning groups 	<ul style="list-style-type: none"> These networks have organized patient forums to respond to HIV/AIDS in diverse communities, as well as teen pregnancy. To improve HIV care, they are working to roll out standardized care protocols in line with national guidance

Note: NHS = National Health Service.

*Most of these networks were mandated by national policy, although a few developed organically. Funding sources have been varied. Some original networks, including the clinical genetics network and the sexual health networks, have been defunded or repurposed. Note also that England still has a series of other managed clinical networks in cardiovascular; maternity and children; cancer; and mental health, dementia and neurological conditions (and some other clinical areas) — organized locally, with national integration.

managed networks focused on cancer. Creation of the networks was not felt to be organic, relationships with operational partners were suboptimal, and individual health care organizations retained their own identity, agenda and culture, rather than contributing to a common network identity and purpose.¹²

Scotland

The systematic review included 1 quasi-experimental interrupted time series analysis evaluating the impact of a cardiac services network on 16 process indicators, noting an improvement in 11 of them. Two indicators, including pain-to-needle time < 90 mins and the proportion of patients receiving β -blockers at 6 months, showed a statistically significant improvement.¹³ In a low-quality observational before-and-after study evaluating the impact of the establishment of the sarcoma managed clinical network, there were improvements in all primary process outcomes, including a reduction in the time interval from referral to initial assessment by the service (from

median 19.5 to 10 days ($p = 0.016$).⁶ Further information on Scotland's strategic networks is summarized in Table 2.

New South Wales, Australia

Since publication of the 2016 systematic review,³ a comprehensive high-quality review was published in 2018, on the impact of 19 networks within New South Wales operating from 2006 to 2008.⁴ This study assessed the impact of the networks on quality of care (e.g., guideline-recommended care, health system access) and system-wide change (e.g., new service or model of care) across a variety of areas using independent longitudinal health system data. An independent expert panel used a comprehensive 3-phase approach to determine whether the impact was low, moderate or high, including determining if it was a result of the clinical network. Three networks (37%) had moderate impact and 3 networks (16%) had high impact. For facilitating system-wide change, 7 networks (37%) had moderate impact and 7 (37%) had high impact. More details of New South Wales' strategic networks are summarized in Table 3.

Table 2: Characteristics of 33 managed clinical networks in Scotland*

Network purpose	Members	Leadership structure	Resources	Processes
<ul style="list-style-type: none"> The networks operate across a wide variety of areas.^{14,15} Some are mandated in specific areas of health such as diabetes, coronary heart disease, stroke and cancer. There are also regional and local networks Networks must apply to gain network status, involve patients throughout the establishment process, agree to follow a set of defined principles and operational guidelines, and show benefits Networks must have a clear leadership structure, a clear statement of the specific clinical and service improvements that patients could expect; adhere to the evidence base; and seek to create new evidence where possible Networks must generate better value for money, have the potential of networking with social as well as health care; and enable integration with health boards 	<ul style="list-style-type: none"> Health professionals Organizations from primary, secondary and tertiary care Patients Carers Families Voluntary groups 	<ul style="list-style-type: none"> Each network is led by a lead clinician, a network manager and an administrator, accountable to local NHS board(s) and NHS Quality Improvement Scotland. Network leadership has some degree of autonomy to meet specific patient needs, and have some flexibility within their mandate to identify their own priorities NHS Quality Improvement Scotland is responsible for endorsing, supporting and monitoring the progress of managed clinical networks 	<ul style="list-style-type: none"> Start-up resources are generally made available from the Scottish Executive Health Department Funding is generally time limited (first 2 years), after which boards are expected to fund networks from their existing funding envelope Networks do not hold funding for direct care delivery, and instead work with local NHS boards to inform and influence strategic funding to support priority work identified by networks 	<p>The usual clinician-driven process is as follows:</p> <ul style="list-style-type: none"> Establish the evidence base for interventions or elements of care Develop evidence-based standards that are consistent with the NHS Use experiences to develop protocols and to share good practice Perform clinical audit to improve patient care Apply protocols and support local clinicians across wide geographical areas to offer care locally to patients within national protocols Subsequently re-audit to assess the impact on patient care Assist clinicians in gathering information about their performance Produce annual reports

Note: NHS = National Health Service.
*These networks were initiated in 1998.

Alberta, Canada

Alberta has 16 strategic clinical networks that were modelled on the clinical networks in England and Scotland.²⁰ General information on Alberta's strategic clinical networks is summarized in Table 4. Three examples of the impact of strategic clinical networks working together with operational leaders and programs within Alberta are highlighted, including improving appropriate antipsychotic use in dementia, enhancing recovery after surgery and the provincial stroke action plan.

Given an adverse safety profile for atypical antipsychotics, improving appropriate use of antipsychotics in patients with dementia living in long-term care facilities was identified as a priority. A clinical pathway in use in Manitoba was modified, piloted and subsequently spread provincially across all 170 Alberta long-term care facilities, resulting in a reduction in antipsychotic use from 26.8% to 17.4% between 2012 and 2017.²²

The Enhancing Recovery After Surgery International Society colorectal guideline has been widely studied,²³ and shows shorter stays, fewer complications²⁴ and lower costs.²⁵⁻²⁷ Although originally developed as care bundles for patients

undergoing colorectal cancer surgery, it has been expanded to a variety of surgeries, each of which is being implemented and continuously evaluated across Alberta.²⁸ An early evaluation within colorectal cancer surgeries showed length of stay reduced by 1.5 days ($p < 0.001$), complication risk lowered by 11.7% ($p = 0.014$) and increased cost savings.²⁸ However, not all evaluations have shown improvements,²⁹ emphasizing the importance of ongoing monitoring across different surgical types and settings.

Stroke care and outcomes varied substantially across Alberta, with delayed access to stroke treatment and worse outcomes in rural areas. A series of activities were undertaken to address these inequities,³⁰ which has resulted in improved door-to-needle times from 70 to 36 minutes provincially, including across urban and rural stroke centres,^{31,32} which in turn translates to improved outcomes in stroke survivors.

All strategic clinical network projects track return on investment. A comprehensive return on investment analysis was done for the first 15 strategic clinical network projects, including the impact on hospital bed days avoided and other cost savings. It was estimated that more than 143 800 hospital bed days were

Table 3: Characteristics of clinical networks in New South Wales, Australia*¹⁶

Network purpose	Members	Leadership structure	Resources	Processes
<ul style="list-style-type: none"> • Networks are formed around specialty health service areas, although they are meant to work with local primary care groups to ensure integration • Networks have a system-wide focus where members identify and advocate for models of service delivery (e.g., outreach services, new equipment, using technology to improve diagnosis) and quality improvement initiatives¹⁷⁻¹⁹ • The goal is to improve health services and health outcomes by developing services based on clinical need, improve the quality of care and safety for patients, increase equity of access and outcomes within the hospital system, and enable clinician- and consumer-driven planning¹⁹ 	<ul style="list-style-type: none"> • Volunteer health care professionals (primary care physicians, specialists and allied health) as well as patients and carers • Each network has more than 230 members on average, including about 30 on each network's executive committee 	<ul style="list-style-type: none"> • Medical, nursing and allied health clinicians act in a voluntary capacity as co-chairs, and salaried network managers provide operational-level support • Networks are accountable to the New South Wales Agency for Clinical Innovation, which is a board-governed statutory organization, operated and funded by the New South Wales State Health Department 	<ul style="list-style-type: none"> • Networks have been funded by the New South Wales state government via an annual budget⁴ • Funds are available for larger-scale projects on a competitive basis of about AU\$100 000 (per project)¹⁹ 	<ul style="list-style-type: none"> • Networks are free to select the priority areas of focus • All networks implement their activities in association with the State Health Department and the Area Health Services¹⁹ • Key tasks include focusing on providing high-quality, patient-centred care; streamlining emergency department processes; reducing unwarranted variation in care; reducing readmission rates; introducing new service models; tightening performance standards; driving health system integration at local levels; testing system-wide approaches; promoting local health pathways; supporting effective transfer of care; and aligning financial incentives and performance

*There are more than 30 coordinated managed clinical networks, which were initiated in 2001.

avoided, with net savings of \$62.5 million (including direct cost savings of \$16.4 million) (unpublished data).

Based on studies from these 4 jurisdictions, system-wide clinical networks would appear to improve quality of care in the health system and to facilitate system-wide change. However, the 2016 systematic review³ also noted some studies that showed no impact.

What influences the effectiveness of clinical networks?

The qualitative studies noted within the 2016 systematic review sought to explain how and why networks worked, or did not work, and what factors led to their success.³ Findings indicated that successful networks were those that had adequate resources, credible leadership and efficient management, coupled with effective communication strategies and collaborative, trusting relationships. The importance of well-designed and strategically aligned projects, and effective partnerships with operational partners (i.e., front-line health services delivery teams) and professional organizations was also emphasized.^{3,33}

A comprehensive qualitative review of clinical networks in England and Scotland^{8,11} also noted the importance of being inclusive and having strong, credible and influential leaders, skilled in negotiation, facilitation and influence with clinicians and National Health Service health boards. Successful networks were those able to encourage system integration, maintain strong 2-way communication, and align network vision and priorities with the wider organizational environment.

Among the Australian networks,⁴ those with higher ratings of impact on quality of care also had better-perceived strategic and operational network management. Higher ratings of impact on system-wide change were associated with better-perceived leadership of the network manager and strategic and operational network management.

There have been differing views on the advantages of voluntary versus mandated networks. Voluntary networks are felt to enable bottom-up development of priorities and encourage grassroots participants, whereas mandated networks are felt to increase legitimacy and links to operational and policy partners within the health system.⁸ Having a set of core principles by

Table 4: Characteristics of 16 clinical networks in Alberta, Canada*²¹

Network purpose	Members	Leadership structure	Resources	Processes
<ul style="list-style-type: none"> • Networks exist across diverse clinical areas, from specialist to primary care and public health • The mission of the networks overall is “improving the health of Albertans by bringing together people, research and innovation” • Each strategic clinical network is guided by its strategic priorities 	<ul style="list-style-type: none"> • Each network’s core committee has 30–40 network members who meet 4–6 times per year. Committee members include front-line clinicians, operational partners within and outside acute care, patient and family advisers, researchers, policy-makers and charitable foundations • Patient and family advisers are key members across the networks and are embedded in all activities and projects, including network leadership 	<ul style="list-style-type: none"> • Networks are led by a senior medical director, senior provincial director and a scientific director, reporting to executives from the single provincial health authority, Alberta Health Services • These individuals are jointly responsible for building and facilitating partnerships across the health system, engaging stakeholders, integrating health services and overseeing network activities 	<ul style="list-style-type: none"> • The annual operating budget of each network is about \$1.2 million • Core funding is provided by Alberta Health Services, but there are also competitive funding opportunities for projects (which support strategic priorities), and for scaling and spreading successful projects provincially 	<ul style="list-style-type: none"> • The stages of strategic clinical network work include measuring current health status and the performance of the health care (and social support) system, identifying gaps in care, and working with patients and policy-makers to prioritize those that are most important • To address the key priorities, the networks review existing evidence and work with researchers and operational leaders to either spread successful interventions or codesign innovative solutions to overcome gaps, improve patient outcomes and reduce health care costs • If mandated careful evaluations show improved outcomes or cost savings, then programs are scaled and spread provincially as appropriate

*These networks were initiated in 2012.

which networks operate appears to enable network performance,¹⁸ even in mandated clinical networks, and experience suggests that networks lacking close partnerships with operational leaders and managers are unlikely to be successful.²⁰

Some early learnings on barriers, and facilitators to network success within a Canadian setting, are available from recent stakeholder consultations on Alberta's strategic clinical networks.²⁰ Many themes emerged, including the critical importance of engagement with patient and family advisers (including codesign of interventions) and health system partners. Because clinical networks do not provide care, participants emphasized the importance of working closely with operational programs to be successful, and although challenging, this was noted to be easier within a provincial integrated system. The importance of 2-way communication was emphasized across all network partners to ensure alignment of activities across networks, with operational leaders, and with academic institutions, whose researchers lead or contribute to network projects.

Clinical networks were noted to have limited ability to influence some system-wide barriers; for instance, physician payment models, physician independence and challenges integrating with primary care. In 2017, Alberta established a primary care clinical network to address this challenge, and a new primary care governance framework is helping to improve communication and alignment. Interviews also noted the importance of ensuring that projects have resources and address operational needs. Finally, interviews noted the importance of role clarity, and coordination to improve efficiency, reduce fragmentation and create opportunities to address interdisciplinary issues.

What are the implications for health systems considering clinical networks in Canada?

With respect to other Canadian provinces, formal provincial clinical networks now exist in British Columbia, with networks launched in rural and remote services, and emergency medicine.³⁴ Other provinces have discussed initiating province-wide clinical networks, but to our knowledge, no provinces other than Alberta and BC have launched them.

System-wide clinical networks have been in existence for nearly 20 years across several countries. They have been implemented to address variation in care, to prioritize areas for activity, implement strategies to increase the use of evidence-based care, and improve outcomes. Networks have evolved substantially over time, incorporating robust inclusion of patients as well as clinicians and policy-makers. Although early results are encouraging, there remains substantial variation in how clinical networks have been implemented, and randomized trials are not available.

Qualitative analyses emphasize the importance of strong leadership, adequate resources, efficient management, well-designed and strategically aligned projects (including robust measurement plans), effective partnership with operational partners, and the critical importance of communication.

For jurisdictions considering clinical networks, a strong leadership commitment and a financial investment is required, both to support the core infrastructure and to fund projects that align

with organizational priorities. Canadian provinces developing clinical networks should consider the opportunities and barriers unique to each province, including the ability to partner effectively with components of the health system provincially. It can take several years for networks to establish priorities, design strategies or interventions to improve care, implement and test in a pilot setting, and then spread and scale innovations provincially. Networks should be established in the context of a robust evaluation plan, both for network projects (which must show improved outcomes and value for money), and to enable improved network structure and processes over time.

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