Special Article

Development of an implementation-focused network to improve healthcare delivery as informed by the experiences of the SCI knowledge mobilization network

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Context: Implementing research findings into clinical practice is challenging. This manuscript outlines the experiences and key learnings from a network that operated as a community of practice across seven Canadian Spinal Cord Injury (SCI) rehabilitation centers. These learnings are being used to inform a new implementation-focused network involving SCI rehabilitation programs based in Ontario, Canada.

Methods: The SCI KMN adapted and applied implementation science principles based on the National Implementation Research Network's (NIRN) Active Implementation Frameworks in the implementation of best practices in pressure injury and pain prevention and management.

Results: The SCI KMN was successful in implementing best practices in both pressure ulcer and pain prevention and management across the various participating sites. Other key objectives met were building capacity in implementation methods in site personnel so that project scaling could occur with these skills and expertise applied to numerous other initiatives. Additionally, various papers, abstracts and conference presentation as well as an implementation guide were disseminated to inform the field of implementation science.

Conclusion: The key lessons learned from this experience are being used to develop a new implementation-focused network. Features felt to be especially important for the SCI KMN includes a highly representative governance structure, the use of indicators within an overall evaluation framework and the systematic application of implementation processes with shared learnings supporting each site.

Keywords: Implementation science, Rehabilitation, Spinal cord injury, Network, Community of practice

Context

Preamble

Despite significant progress, the uptake of research findings into clinical practice remains a challenge.[1–3] New

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advances in the application of systems thinking to understand multi-site scaling of standardized evidence-based practices provides some optimism in addressing this complex issue.[4,5] The vast majority of health-related literature is focused on evidence generation for the effectiveness of interventions or assessment procedures to improve outcomes for the patient. Yet, relatively little attention is paid to understanding methods to ensure effective implementation of these interventions or assessments. Despite the seminal Institute of Medicine report on these challenges almost two decades ago,[6] it is still not fully appreciated that the presence of effective interventions may be inconsequential in the absence of effective implementation. To address these challenges in spinal cord injury (SCI) rehabilitation, Ontario Neurotrauma Foundation (ONF), Rick Hansen Institute, and Alberta Paraplegic Foundation partnered to support a national approach for best practice implementation across several Canadian provinces. This network, termed the Spinal Cord Injury Knowledge Mobilization Network (SCI KMN), operated from 2011–2017. A network-based approach was used to build capacity in implementation science to promote adoption of best practices for the prevention and management of pressure injuries and pain during rehabilitation for persons with SCI.[7,8]

This paper describes a reflection of the key learnings obtained from the experiences of the SCI KMN and outlines a vision for a new implementation network involving SCI rehabilitation programs based in Ontario, Canada.

Background – reflecting on the experiences of the SCI KMN

The SCI KMN aimed to support more effective and efficient SCI rehabilitation by implementing best practices and developing capacity for implementation across health care programs. Original priority areas of pressure injuries, pain, and bladder dysfunction were identified by persons with SCI, however, the network members elected to only address the first two of these areas. The primary rationale for this decision was to focus on skill development in implementation science within a limited number of areas, with the eventual goal that these skills could be applied to any area deemed a priority within the network or individual site. A phased implementation approach began with pressure injury (2011–2014), followed by pain (2014–2017). Table 1 lists the high-level practices selected for implementation for these areas. As part of the implementation process, these practices were broken down in to numerous components to enable operationalization. Rehabilitation sites were identified by the ONF through a readiness assessment.[8] Originally the network included six sites with a seventh site added in August 2015 resulting in a presence across four provinces (Alberta, Ontario, Quebec, and New Brunswick).

The SCI KMN mission was to improve health outcomes for persons with SCI by using implementation science to facilitate the adoption of identified best practices at participating sites. This mission was achieved through the following objectives: (1) developing and applying SCI practice resources using implementation science, (2) strengthening and sustaining knowledge mobilization infrastructure and environments (i.e. capacity-building), and (3) contributing to the implementation science evidence base.

Use of implementation science

Specific activities of the SCI KMN were guided by the National Implementation Research Network (NIRN) active implementation frameworks.[9] NIRN defines implementation as "a specified set of activities designed to put into practice an activity or program of known dimensions." The utilization and nature of the active implementation frameworks within the SCI KMN has been previously described.[7,10]

Briefly, the active implementation frameworks involve specific tools/processes that enable a systematic approach to achieve sustainable implementation.[7,9,10,11] The frameworks consist of (a) Usable Innovations, (b) Implementation Teams, (c) Implementation Stages, (d) Implementation Drivers, and (e) Improvement Cycles. The SCI KMN focused on the latter four of these as Usable Innovations is a relatively recent addition to the frameworks. Implementation Teams (b) informed the teaming structures, whereas implementation Stages (c) represent an evidence-informed trajectory of activities that occur over four stages from planning (termed "exploration") to full implementation. Implementation Drivers (d) involves an examination of the barriers and facilitators within implementing organizations across nine categories known to facilitate implementation. This results in the formation of a comprehensive implementation action plan. Improvement cycles (e) are established processes to enable iterative implementation or to examine the relationship of policy and practice. The most well-known improvement cycle is the Plan-Do-Study-Act (PDSA) cycle which is often used in healthcare for quality improvement. In the context of implementation, PDSA cycles are used to iteratively put into place smaller components of a practice with ongoing evaluation and planning toward final implementation of an overall practice.[7,9,10,11]

Table 1 Best practice recommendations and brief descriptions of some of the related high-level practices.

Best practice recommendation	Description
Pressure injuries	
Conduct comprehensive, systematic and consistent assessment of risk factors in individuals with SCI	(i) Assess and document risk on admission and reassess on a routine basis, as determined by the health-care setting, institutional guidelines, and changes in the individual's health status. (ii) Use clinical judgment as well as a risk assessment tool to assess risk. (iii) Assess demographic, physical/medical, and psychosocial risk factors associated with pressure ulcer prevention.
Provide structured pressure ulcer prevention education to help individuals post-SCI gain and retain knowledge of pressure ulcer prevention practices.	(i) Provide structured pressure ulcer prevention education to help individuals post SCI gain and retain knowledge of pressure ulcer prevention practices. (ii) Provide individuals with spinal cord injury, their families / significant others, and health-care professionals with specific information on effective strategies for the prevention and treatment of pressure ulcers, to assist with gaining and retaining knowledge.
Pain	
Use an interdisciplinary approach to assessment and treatment planning.	Begin treatment with a careful assessment of the following: (i) Etiology, (ii) Pain intensity, (iii) Functional capacities and (iv) Psychosocial distress associated with the condition. Key aspects included: (i) Initial & discharge interprofessional assessment (Guided by International SCI Pain Basic Dataset 2.0), (ii) Interdisciplinary pain monitoring, (iii) Interdisciplinary treatment plan, (iv) Pharmacological and non-pharmacological interventions, (v) Treatment decision support, (vi) Discharge plan/patient self-management.
Address the person's concerns and expectations when agreeing which treatments to use by discussing:	(i) the benefits and possible adverse effects of each pharmacological treatment, (ii) why a particular pharmacological treatment is being offered, (iii) coping strategies for pain and for possible adverse effects of treatment, (iv) that non-pharmacological treatments are also available. Other aspects included: (i) Ask the patient directly did they feel their concerns/expectations were met/dealt with. (Goes into goal setting associated with development of a treatment plan). (ii) Creation of education/communication resources. (iii) Using education/communication resource in discussion with the patient (one-on-one and/or group). (iv) Reporting information back to team for plan development/plan revision. (v) Ensure expectations/concerns addressed in unstructured, individualized way.

As the SCI KMN gained more experience with the NIRN active implementation frameworks in supporting best practice implementation, some of these were adapted to fit the context of SCI rehabilitation. A guide outlining these adaptations and also identifying key implementation processes was produced to facilitate successful future implementations.[11]

Network structure and collaboration

A key aspect of the SCI KMN was that it was self-organizing – i.e. working collectively to develop governance and decision-making processes. This included the identification and use of structures and supports required to ensure optimal communication between sites and sponsors. Figure 1 illustrates a generalized depiction of this teaming and organizational structure.

Central resources were established to support network activities including network management (Lead and Manager) and implementation consultants. These consultants provided expertise in the use of NIRN frameworks, helped develop implementation capacity, and provided additional assistance as needed. The Lead and Manager developed the strategy for achieving network objectives in a timely fashion in addition to supporting day-to-day operations (collaboration, coordination, and communication) across the network. Collaboration and communication was aided through Microsoft SharePoint by sharing and updating documentation, facilitating online discussions, and utilizing

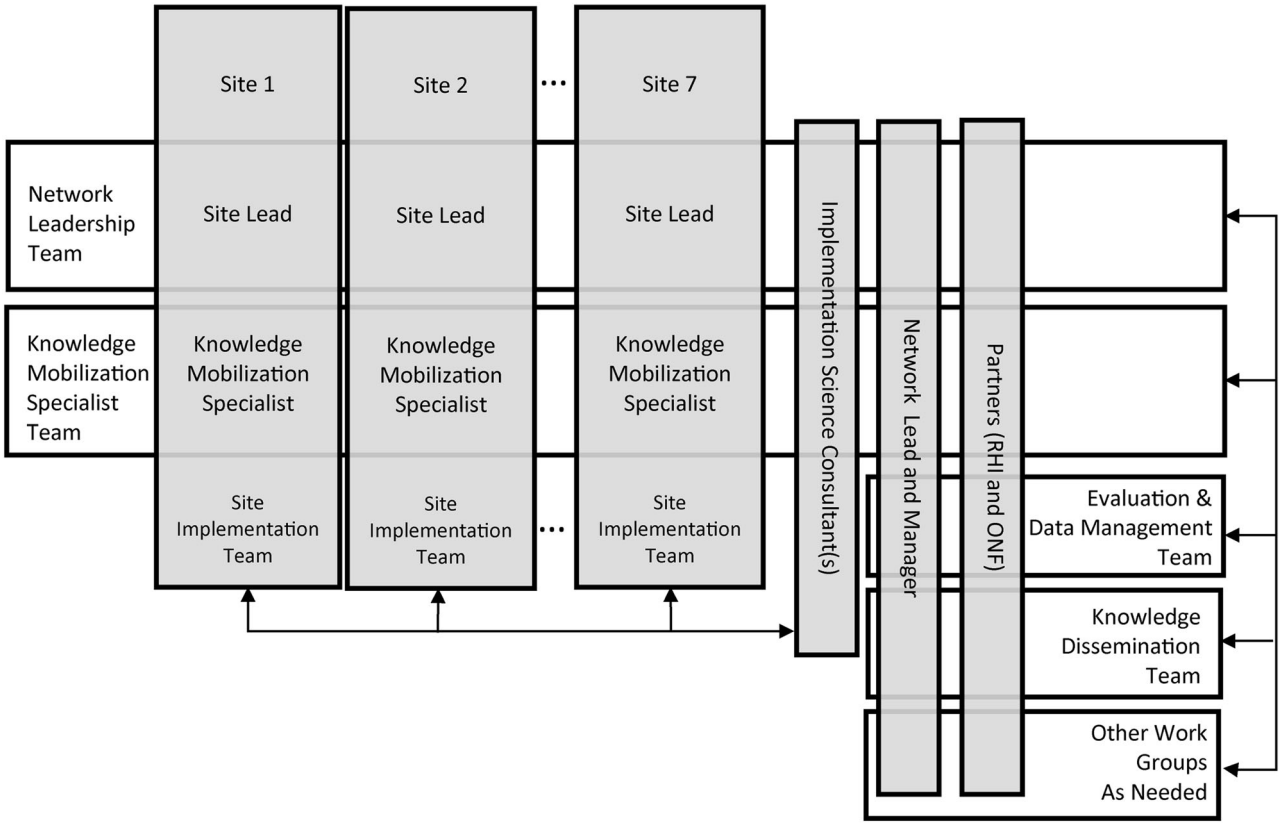

Figure 1 Organizational and teaming structure of the SCI KMN.

workspaces to organize meeting agendas and documents. A Sharepoint site was developed for each team and all network members had SharePoint access.

Network sub-teams were established to support the various facets of best practice implementation:

- Network Leadership Team: provided oversight, guidance, and leadership for strategic planning and coordination of network activities.
- Knowledge Mobilization Specialist (KMS) Team: provided links between individual site and collective network project activity.
- Evaluation and Data Management Team: planned, designed and implemented the SCI KMN evaluation that enabled collection and analysis of meaningful data across the network that supported cycles of quality improvement. Additional evaluation processes specific to each site were also planned and conducted at a local level.
- Knowledge Dissemination Team: ensured knowledge sharing and collaboration within the network and dissemination externally.
- Site Implementation Teams: local stakeholders from an array of disciplines and perspectives (e.g. clinicians, administrators, researchers, persons with SCI, etc.) within a site working together towards successful implementation and capacity-building. These teams were led by the KMS.

Typically, teams met on a monthly and ad hoc basis, along with regular discussions and activities. A summary of discussion and action items was prepared following each team meeting. Each team (except local teams) had representation from all sites, network management, and sponsors. Teams developed terms of reference to ensure clear understanding of purpose, function, membership, and shared decision-making processes.

Capacity-building

Establishing an environment where an intentional, innovative and systematic approach to implementation flourishes is challenging. By following the various processes embedded in the active implementation frameworks,[11] and by embracing a participatory and self-directing approach, the SCI KMN enabled local leaders and practitioners to implement, adapt, and enhance innovations across their organizations. A key goal was to build implementation capacity at participating centers to support the implementation of future interventions and best practices. Training and coaching were two of the most important activities to build this capacity.

Beginning in May 2011, NIRN consultants provided implementation science training associated with the

active implementation frameworks. Training was completed over multiple sessions and incorporated three interactive webinars, individual site visits, and two days of in-person training. Most training activities were directed toward site leads and the KMS who were individuals identified as champions who led local implementation teams – (Note: KMS were termed "Spécialiste de l'application de la généralisation de l'expertise" = SAGE in Quebec). On-site training activities included others who were often part of the site implementation teams. Initial training activities involved evaluations focused on reports of comprehension and satisfaction with the sessions, indicating a moderate level of understanding. Most useful was a "learn-by-doing" approach involving on-going coaching by the NIRN consultants (and later by the KMS) as teams progressed through the implementation processes.

Methods

Learnings were identified via three sources of information. The primary source involved a consensus seeking exercise comprised of a survey of site leads and KMS's followed by a full-day consensus in-person meeting. This survey and the follow-up meeting were structured to inform a Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis. Secondary sources of information included a site survey that examined activities associated with capacity-building and scaling and an evaluation of the indicators and other implementation-related measures collected throughout the life of the SCI KMN.

Survey and SWOT analysis

Sites were asked to complete a survey of open-ended questions designed to elicit information regarding strengths and weaknesses and opportunities and threats. Responses to these questions were collated and shared with site representatives (site leads and KMS's) prior to the follow-up meeting held in April2016. At the day long meeting, sites were led through a set of facilitation exercises to achieve consensus and organize findings in to a SWOT analysis. This consolidated set of learnings were intended to provide an overview of SCI KMN experiences that could also be used in future planning efforts.

Capacity-building survey

The degree to which sites scaled their implementation capacity to other initiatives was captured in a March 2016 survey. This survey was conducted when sites had completed initial implementation of pressure injury-related practices but were mid-way through pain-related implementation. Sites were asked to identify the numbers of persons conducting training (i.e. often a train-the-trainer model) or that were recipients of training in implementation science. They were also asked to identify the number of projects (along with brief project descriptions) involving processes emanating from the SCI KMN-related training (in addition to the work on pain or pressure injuries).

Evaluation of indicators and other implementation-related measures

Early in the planning of the network, sites agreed upon key indicators and surveillance data that would be collected to evaluate the effectiveness of implementation of pressure injury best practices by using a Delphi process.[12] A similar process was conducted to identify pain best practices. The evaluation plan comprised four key elements:

(1) Process indicators: Were the agreed upon practices being completed for each patient? (e.g. each site captured whether or not a pressure injury risk assessment was conducted for each patient)
(2) Outcome indicators: What was the impact of practices for patients? (e.g. responses to a patient-reported survey involving five likert-based questions of perceived effectiveness of the delivered education).
(3) Surveillance data: Data regarding the potential long-term impact of implementation efforts (e.g. incidence and prevalence of pressure injuries and pain).
(4) Implementation data: How do sites progress through the stages of implementation and address implementation drivers? (e.g. for the initial pressure ulcer implementations, sites captured their relative progress through the NIRN stages of implementation and which specific implementation drivers were part of their implementation action plans).

The network utilized the Rick Hansen Institute's Global Research Platform to support secure and standardized data collection across sites using a central, national data repository, similar to but separate from what was in use by each site as part of a National Registry (Rick Hansen SCI Registry).[13] Each site obtained separate ethics approvals appropriate for their institutions, although some jurisdictions provided a waiver if network activities were deemed to be quality improvement. Regardless, all data collected within the central repository was de-identified with respect to personal health information and data sharing was governed by an agreement involving all sites. The Global Research Platform system enabled the development of custom, logic driven data collection forms. Individual sites entered and accessed their own data through a secure

web portal. A network-wide analysis was completed following a data cleaning process.

A summary of the implementation processes and outcomes within the area of pressure injuries has recently been published.[7] A fulsome evaluation of the cross-site implementation data and data associated with pain practices has yet to be completed; however, each site completed local analyses to inform PDSA cycles for practice improvement.

Results – key learnings and guidance for forming a new implementation network

The learnings outlined below have been organized according to the primary objectives of the SCI KMN, along with additional observations felt to be important to network effectiveness.

Objective 1: Implementation of best practices. The adoption of an intentional and systematic approach to implementation (e.g. NIRN active implementation frameworks)[8,9] was essential to successful and sustainable implementation. The approach also needed to incorporate the flexibility to allow adaptation to local context, as described in a publicly available implementation guide.[11] Examples of implementation processes felt to be particularly helpful included practice profiling and implementation driver analysis. Practice profiling enabled sites to identify the critical sub-components of best practices and embed the necessary operational details and supports.[14] Implementation driver analysis identified existing resources, infrastructure, and processes (or lack thereof) to inform a comprehensive implementation action plan.[15]

Establishment of a consistent evaluation framework for each objective was also crucial. It was significant that both process and outcome indicators were developed by a team of network members using an online Delphi process.[12] In addition to the importance of a multi-faceted evaluation framework, the fact that this was developed in a very participatory way (i.e. co-designed by representative stakeholders) added to the sense of ownership by network members, thereby increasing engagement and ultimately compliance. Over the past 2 years a pan-Canadian initiative termed SCI Rehabilitation Care High Performance Indicators (SCI-HIGH) has developed a set of structure, process, and outcome indicators spanning many domains of interest to persons with SCI. Much of this work is described within the present issue and will also serve as a starting point for the emerging Ontario implementation network outlined in the "Next Steps" of the present manuscript.

Implementation science has established that timely performance assessment, especially as related to key process indicators, is essential for facilitating implementation and practice improvement.[16,17] This is consistent with the observation that audit and feedback is one approach that has evidence for implementation success, albeit limited if used as a stand-alone implementation strategy.[16] The absence of adequate supports and resources for data management and analysis (participating sites and central network) was identified as a principal limitation for effective implementation, which is also consistent with observations from the KT literature.[17] There was considerable variability among individual sites with respect to the time frames for which they were able to collect and use data for PDSA cycles (i.e. weeks to months). No site achieved the capability for real-time data use for supporting local implementation efforts. For overall evaluations, data were collected centrally and analyzed retrospectively, limited by the constraints of the available central data management system. This forms a key learning opportunity for the new network. More timely evaluation needs to be a core component of initial planning and eventual development of a more facile data management system will be an important strategy. This needs to incorporate both local and central systems for data collection and coordination. When possible, existing data collection systems should be employed (especially those involving point of care data capture and use).

Challenges related to data management and effective data utilization are numerous; especially when balancing: (1) local site needs for systems that support efficient data analysis and communication (e.g. visual representations) to support implementation and improvement cycles vs. (2) central functions that enable benchmarking and evaluation. Our experience suggests that early attention needs to be paid to this along with site-specific concerns such as different regulatory environments (e.g. ethics, risk/privacy issues). In addition, existing work flow and available local IT infrastructure need to be considered alongside central needs. This is especially important for sustainability, as reliance on manual and/or retrospective processes for data capture and analysis can be challenging to integrate into day-to-day site operations despite potentially having less front-end costs.

Objective 2: Site capacity-building in implementation science. The ability of some sites to scale and leverage implementation expertise to support local priorities, even beyond SCI rehabilitation, exceeded expectations. Critical to this was the availability of implementation

experts (both external NIRN consultants and eventually site KMS's). Importantly, there was an expectation from the beginning that capacity-building would be reflected in a gradual reduction in the level of involvement of the external consultant, in favor of the development of the KMS. This individual was carefully selected for each site and provided with dedicated time and resources to act as a coordinator/champion of implementation. At some sites this role was shared (e.g. clinicians of various disciplines and/or research staff) in an effort to spread capacity and expertise as a mechanism to promote sustainability. The sites that achieved the greatest success with scaling and sustainability (e.g. embedding these types of roles into existing capital budgets) were those that had meaningful administrative sponsorship from network inception.

Across the entirety of the SCI KMN: 27 individuals had a role in building Implementation Science capacity, 62 individuals were trained in and/or utilized Implementation Science/NIRN Frameworks, and 41 additional projects utilized SCI KMN learnings or implementation frameworks/processes (i.e. beyond pain or pressure injury implementation).

Sites were able to apply these principles to other areas of interest (within and beyond SCI) and to successfully address organizational priorities (e.g. Accreditation). Survey results demonstrated that the level of spread and scaling achieved was much greater than anticipated. Over time site implementation team members developed increased confidence in applying the principles of implementation science, as indicated in increases in measures of self-efficacy with the application of implementation science principles. Overall, most sites felt they had advanced positively in their culture of implementation and quality improvement.

As part of the SWOT analysis, SCI KMN sites described numerous benefits related to enhanced implementation capacity. Examples included the following:

- Support and commitment from front-line clinicians and leadership
- Teams were able to stay on track because of the national focus (i.e. provision of external validation)
- Staff buy-in due to enhanced involvement and responsiveness to concerns that is built into the implementation processes
- Adopting a culture of continuous practice improvement: confidence that changes are going to be sustainable and worthwhile.
- Strengthening of working relationships/camaraderie and inter-professional communication

Objective 3: Contribute to and advance the science of implementation. This proved very complimentary to Objective2. Network members were very engaged in disseminating and examining their work in an academic context. These activities strengthened and reinforced implementation capacity. In addition to authoring several published abstracts[18–20] and peer-reviewed publications,[7,8,10,12] the SCI KMN produced an implementation guide chronicling the use of the NIRN implementation frameworks with accompanying adaptations and experiences to guide others with similar implementation efforts.[11]

Additional learnings involved the way that network members worked together. This was reflected by the governance structure (see Fig. 1) with sponsors and central personnel working alongside site members. Network activities were able to be self-directed (i.e. as opposed to external direction) with consensus agreement on primary network deliverables (i.e. indicators). There was also site autonomy to use resources for local priorities provided the primary deliverables were met. An overall network lead and manager were essential as central supports to ensure network activities continued. Similarly, site leads and site KMS's worked with the site implementation team in addition to participating in overall network activities. Site KMS's were instrumental to the network and served as a critical link between leadership (network and site) and front-line activities.

Finally, an oft-noted observation across all sites was that the very nature of belonging to a vibrant learning-focused network that operated as a community of practice was an essential aspect for achieving and maintaining success. The benefits of this were multi-faceted. There is added value in sites being associated with the larger network for sharing learnings and resources, for standardization of care nationally, for mutual support and for identifying and seizing upon opportunities for alignment and coordination with existing initiatives. An unexpected and appreciable benefit was the perceived external validation of the network in maintaining focus with the priority topics of interest selected through network consensus. Most sites operated within large organizations where the SCI rehabilitation program was only one small program among many, therefore the threat of being taken "off-task" was identified as a common occurrence by several sites.

Next steps – towards an Ontario implementation-focused network

An important legacy of the SCI KMN that is a form of capacity-building and is currently unfolding is associated with several groups planning for future implementation-focused networks within regional health jurisdictions (e.g. Alberta is planning implementation

efforts focused on bladder health and Ontario plans are briefly described below). Within Ontario, we are in early development of an implementation-focused network across all academic health centers providing rehabilitative care to persons with SCI. This network is termed the Ontario SCI Implementation and Evaluation Quality Care Consortium. The key learnings described above will be employed within the Consortium with attention paid to the following:

- mentorship of sites in intentional and systematic implementation processes,
- timely performance assessment beginning with SCI-HIGH indicators, and
- a highly representative governance structure that promotes meaningful involvement of members.

Other aspects to be operationalized within this new Consortium, as identified by a planning group sponsored by ONF, include the following features: be self-organizing, have supports for optimal communication between sites and sponsors, have central resources, smaller sub-teams tasked with specific activities, central data repository, enable local leaders and practitioners to adopt and implement innovation within their organizations, knowledge dissemination/exchange and to promote alignment with existing initiatives.

Ultimately, the vision of the Consortium is to achieve a highly collaborative community of practice involving sites dedicated to providing health care to persons with SCI and their families. The intent is to provide and implement practices in an environment characterized by constant learning and improvement. Evaluative processes will be embedded at the onset and the overall goal will be the attainment of the best possible outcomes no matter where in the province a person receives service. This will be achieved through a partnership of academic health centers providing rehabilitative care to persons with SCI, the ONF, SCI Ontario and the Ontario SCI Alliance. These partners bring together service providers, funders, and a community agency with persons with lived experience at the center to support advocacy and policy directions. A strong foundation in the principles of implementation science will be instrumental to the success of the Consortium. Activities will be designed to build capacity in effective and sustainable implementation and address the priorities of the SCI community. Efforts will be directed toward specific domains (e.g. mobility, emotional well-being, sexual health, etc.). The SCI-HIGH process, structure and outcome indicators will serve as starting points for the Consortium activities. Initial and continuous collection of indicators will help identify additional practices and processes that may be targeted for implementation or process improvement as well as provide a basis for evaluation and constant learning. Sustainability will be a key consideration from the start in that leadership across all organizations will be involved in examining different approaches for this to occur.

Summary

The present manuscript describes several key lessons learned from seven years of participation in an implementation-focused network across seven Canadian SCI rehabilitation sites. Among the most important of these were to have a highly representative governance structure, to employ primary indicators associated with key practices implemented as part of an overall evaluation framework and the systematic application of implementation science-based processes with opportunities for sharing ongoing learnings and implementation training supporting each site. As noted at the outset, without effective implementation even the most effective intervention will yield no or minimal improvement. It is hoped that the field will continue to strive for innovative ways to test and learn from each other in ensuring evidence is effectively translated into practice so patients obtain the best outcomes possible.

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