"Making Canada Whole": Multi-Jurisdictional Collaboration as a Strategy to Advance Supply Chain Resilience for Canadian Health Systems

Anne W. Snowdon, Alexandra Wright, Saba Ghadiri and Cindy Ly

Abstract

This paper describes a framework that engages diverse leaders and decision-makers across Canada's federal, provincial and territorial jurisdictions to build collaboration that overcomes the silos and competition among jurisdictions during healthcare supply disruptions. The collaboration model proposes to address the challenge of fragmented and competitive approaches among Canadian jurisdictions to source and manage supply shortages, which increases the risk of harm for both patients and the healthcare workforce. Empirical evidence of outcomes and effectiveness of collaborative engagement across jurisdictions is presented to demonstrate the potential for a "Whole Canada" approach to coordinating management of supply disruptions and strategies that mitigating the risk of supply disruptions for patients and health system capacity to deliver care. Simulations were used to pilot the framework, focusing on supply management strategies that reach across Canadian jurisdictions to mitigate risks of supply shortages to ensure that all Canadians have access to safe and sustainable healthcare services.

Introduction

Healthcare supply chain fragility is one of the most significant and persistent threats to the capacity of health systems in Canada to deliver quality and timely care to patients. In 2023 alone, more than 3,000 drug shortages were reported (CGPA and CAPDM 2025) that impacted access to care and placed both patients and healthcare workers at risk. For example, widespread shortages of children's pain relievers, such as acetaminophen and ibuprofen, led to high demand for emergency room care and significant parental distress as parents searched for these products to bring relief to their children (Brend 2022). In oncology, repeated shortages of chemotherapy drugs, such as vincristine, have forced delays or modifications to pediatric cancer treatment plans, raising concerns about compromised patient outcomes (Barrett 2019). These disruptions are not isolated events, but part of a persistent, system-wide, supply chain fragility that threatens the quality of health services and patient outcomes across Canada.

Despite the impact of these shortages, supply management responses remain highly fragmented from one jurisdiction to another. Canada's federated governance model delegates responsibility for healthcare delivery to individual provinces and territories (Allin et al. 2020). When health products are in short supply, there is significant competition between provincial and territorial jurisdictions for health products, often disadvantaging smaller or rural jurisdictions that may have more limited market influence and fewer financial resources to manage supply shortages with less purchasing power (Beaulieu et al. 2022; Snowdon et al. 2022). During the COVID-19 pandemic, global supply chain shortages resulted in intense competition across organizations, jurisdictions and countries,

driving up costs and exacerbating inequities for patients seeking care (Allin et al. 2020; Beaulieu et al. 2022; Cameron-Blake et al. 2021; Marchildon et al. 2020; Zhang et al. 2022). Provinces with smaller populations and greater rural and remote communities experienced intense competition for supply, leading to clinicians struggling to deliver patient care without the necessary products to do so (Amoak et al. 2024; Brophy et al. 2020; CMA 2020). Lack of coordination or real-time data exchange across jurisdictions further posed risks to patients, the workforce and health system capacity to deliver care that could not be either anticipated or managed proactively (Snowdon et al. 2021; Snowdon and Saunders 2021).

The Supply Chain Advancement Network in Health (SCAN Health) established a community of practice (CoP) to engage leaders across sectors and jurisdictions to co-design solutions to overcome supply chain fragility in Canada. Leaders from government agencies, industry and the healthcare workforce collaboratively co-designed solutions to address the fragility of the healthcare supply chain, including limited visibility of supply chain data and inconsistent or a lack of coordination across jurisdictions. A Leadership and Policy Workgroup was convened with a specific mandate to develop leadership and policy solutions to advance supply chain resilience, strengthen collaboration and promote transparency across jurisdictional boundaries and sectors. Over a two-year period, senior leaders engaged in a structured dialogue and co-design process to explore how collaboration could strengthen Canada's capacity to respond to supply chain disruptions more effectively.

This paper presents a Multi-Jurisdictional Collaboration Framework (MJCF), co-designed by healthcare supply chain stakeholders, and validated through simulation exercises. The framework offers a collaborative, coordinated model designed to strengthen Canada's collective capacity to anticipate, respond to and manage healthcare supply chain disruptions in the future.

Literature Review and Background

Canada's healthcare supply chain has experienced sustained and escalating supply disruptions over the past decade, revealing significant vulnerabilities that undermine the safety of patient care, workforce safety and capacity to deliver care due to supply disruptions (Snowdon and Forest 2021; Snowdon et al. 2022). Product shortages have become persistent and systemic. In 2017, hurricane-related disruptions in Puerto Rico led to a national shortage of intravenous fluids (e.g., IV bags) (Aguero and Allen 2024). In 2022, a global shortage of iodinated contrast dye resulted in widespread cancellation of diagnostic imaging (e.g., CT scans) services for many Canadians (CADTH 2023). Recurrent shortages of vincristine have interrupted pediatric cancer care (Barret 2019), and during the COVID-19 pandemic, personal protective equipment (PPE) was in short supply across all jurisdictions (Snowdon et al. 2022). Canadian health systems reported 3,098 drug shortages in 2023, with an average duration of 93.5 days (CGPA and CAPDM 2025). These events are indicators of a health supply chain strategy that lacks the capacity to anticipate, coordinate and respond to supply disruptions within and across Canadian health systems.

Canada's healthcare supply chain has experienced sustained and escalating supply disruptions over the past decade, revealing significant vulnerabilities that undermine the safety of patient care ...

While Canada's federated governance of health systems supports local autonomy, it has produced highly fragmented procurement and supply management systems, with no formal mechanisms to support coordination or shared accountability (Snowdon et al. 2022). As a result, manufacturers and distributors must navigate a patchwork of provincial and territorial policies, procurement requirements and contracting processes, making distribution and national purchasing power more limited. During shortages, jurisdictions compete globally for access to products, which further weakens Canada's collective market influence and undermines relationships with global suppliers. Canada accounts for approximately 2% of the global health supply market, which results in limited market influence and significant challenges for suppliers to efficiently distribute products across Canada's vast geography (Global Affairs Canada 2024; Health Canada 2024). Jurisdictions with larger populations benefit from greater economies of scale, greater market influence and stronger vendor relationships, securing products more rapidly, while smaller jurisdictions often face delayed or limited access to critical products (Beaulieu et al. 2022; Cameron-Blake et al. 2021; Snowdon et al. 2022). These inequities have been associated with profoundly negative impacts on patient care, workforce safety and health system performance (Amoak et al. 2024; Snowdon et al. 2022, 2024).

Several federal-provincial-territorial (FPT) committees have been established to engage jurisdictional leaders in managing the health supply chain shortages. These include the FPT Drug Shortages Steering Committee, the FPT Medical Devices Working Group, the FPT Emergency Management Committee and various vaccine-specific oversight groups convened by the federal government (Health Canada 2025a, 2025b; PHAC 2017). These committees primarily serve consultative and policy advisory functions. For example, the Drug Shortages Steering Committee, chaired by Health Canada, oversees the Multi-Stakeholder Toolkit and Tier Assignment Framework, which assesses shortage severity and promotes voluntary reporting by manufacturers (Health

Canada 2023; MSSC 2017). Similarly, the medical devices and emergency management committees focus on information sharing but have no operational oversight of supply logistics. Provincial and territorial governments typically engage these committees once local mitigation efforts are exhausted and shortages are already affecting patient care. When a critical shortage is identified, a tier assignment committee may be convened to review severity, assess national impact and recommend risk mitigation actions, such as emergency importation of alternative products or changes to regulatory requirements (Santhireswaran et al. 2023). While these mechanisms support health system responsiveness to supply disruptions, they are not designed to support collaborative and proactive supply chain management across jurisdictions focused on risk mitigation for patients and the health workforce.

Most Canadian jurisdictions rely on localized, manual supply chain processes, which limit the flow of data to inform leadership decisions to manage or anticipate product shortages or to coordinate response strategies to manage risks to patient care (Medtech Canada 2021; Snowdon and Wright 2022). During the contrast dye shortage, for example, hospitals and clinics individually searched for the product without visibility into supply availability or risks within or across their own or other jurisdictions. The absence of a digital supply chain infrastructure also impacts national-level forecasting, emergency stockpile deployment and prioritization of vulnerable populations in order to mitigate risks for the patients most vulnerable to product shortages (Dyer 2020; Laing and Westervelt 2020). Although some provinces have made progress toward a digitally enabled supply chain, the lack of digital infrastructure and limited collaborative governance approaches challenge health systems to engage in cross-jurisdictional collaboration to more effectively manage shortages and advance supply chain resilience.

Health product shortages are increasingly national in scale but are managed through jurisdictionally siloed processes that lack coordinated leadership, a common data infrastructure or formal accountability for a coordinated response (Lau et al. 2024). Existing FPT committees offer valuable consultation and crisis response efforts, but do not have the governance mandate to operationalize coordinated supply management focused on risk mitigation. While digital infrastructure is necessary, it is not sufficient to establish a coordinated, data-driven strategy across jurisdictions to advance a collaborative healthcare supply chain strategy. Supply chain resilience depends on collaborative leadership, clearly defined roles and accountabilities and a governance model able to convene and coordinate operations within and across jurisdictions and sectors (e.g., public sector, private sector) to establish a "Whole Canada" approach. The purpose of the MJCF is to address the challenges of coordination and collaboration across jurisdictions, competition among jurisdictions and gaps in stakeholder expertise to support a more resilient, equitable and integrated healthcare supply chain strategy that serves all Canadians.

Method

This study used a facilitated co-design strategy to develop a leadership and policy strategy to advance and strengthen Canada's supply chain resilience, supported by a Social Sciences and Humanities Research Council (SSHRC) partnership grant (#1154256).

Co-design and framework development

A workgroup was established to co-design leadership and policy strategies that could enhance collaboration for management of supply disruptions across provincial and territorial jurisdictions. The group included 53 senior executives and decision-makers from manufacturing, distribution, group purchasing organizations, provincial supply chain authorities, federal health agencies and health organizations that deliver patient care. Between December 2022 and March 2025, members engaged in 14 iterative sessions using participatory co-design methodology (Bate and Robert 2006; Denecke et al. 2025). The workgroup began with identifying existing policies, committees and operational roles in Canada's supply chain ecosystem. Participants defined strengths and barriers within current jurisdictional structures and processes across provinces, territories and federal agencies. Policy levers and enablers needed to support proactive, collaborative approaches to manage supply disruptions across jurisdictions were identified and defined. Co-design focused on determining how jurisdictions could work together to develop a set of standards that allow product and inventory data to be shared more easily between clinician teams, provinces, territories and even patients.

There was consensus on the need for a national engagement strategy that included clearly defined roles and accountabilities, regular communication and coordination between jurisdictions. As one participant noted, the framework should "engage and support decision-makers and leaders to make decisions during times of very significant shortages of products." Identifying the foundational features necessary for multi-jurisdictional engagement to support collaboration included visibility into supply inventories, data sharing, building trust, enabling proactive leadership and addressing the key barriers to coordination of supply chain management, such as inconsistent supply chain policies and processes across jurisdictions and variations in regulatory requirements. Co-design dialogue informed the design and development of a MJCF, with core principles and key features described in Table 1.

The Multi-Jurisdictional Collaboration Framework

The MJCF was co-designed to offer a system-level solution that strengthens Canada's response to and coordination of supply chain disruptions. The framework prioritized clinical relevance of supply disruptions and risk management to inform a collaborative strategy that reaches across and engages health systems and jurisdictional leadership to advance a "Whole Canada" strategy.

The framework is anchored by six core principles: transparency, equity, visibility, accountability, risk prevention and inventory accessibility, which leaders across the system identified as foundational to transforming Canada's response to supply disruptions. Transparency supports trust and open communication among stakeholders. Equity guides decisions to prioritize access to products based on patient need rather than purchasing power. Visibility of inventory data enables greater collaboration focused on risks to patients and the health system's capacity to deliver care across all jurisdictions. Accountability clarifies who holds authority and responsibility for supply management decisions. Risk prevention focuses on proactively identifying and mitigating risks for patients, the workforce and health system capacity to deliver care. Inventory accessibility ("inventory for all") ensures that jurisdictions can accurately identify available supplies to inform collective action to manage product shortages. The key features of the framework are described in Table 1.

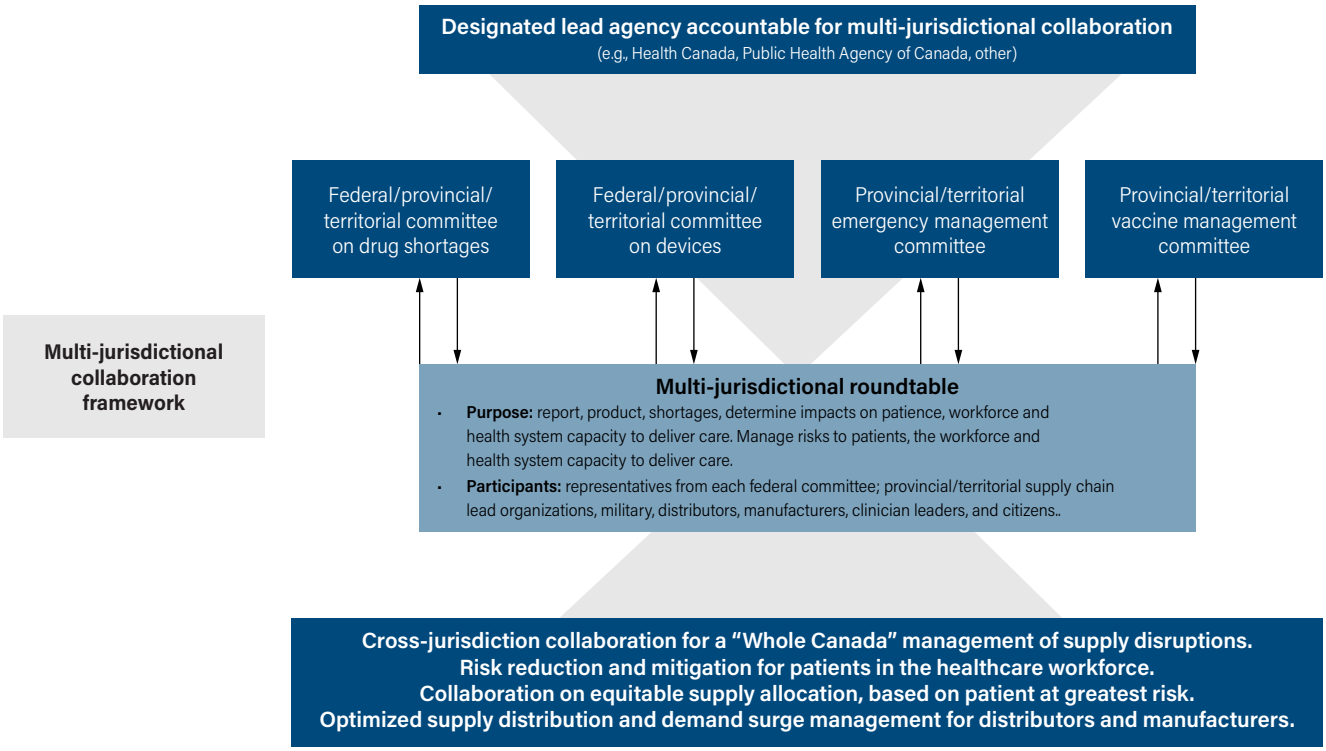
TABLE 1.
Five strategic features of the MJCF

Key features	System gap addressed	Strategic function
Data and information sharing	Lack of visibility into the products currently on hand, location of products available and insights into patients at greatest risk during supply shortages across all jurisdictions.	Enables real-time visibility into product availability and inventory to inform coordinated management of product disruptions, which also reduces duplicative efforts and competition across and among jurisdictions. When products are recalled, jurisdictional leaders can readily identify the location of recalled products to be removed in collaboration with suppliers
Risk assessment	Absence of standardized tools to evaluate clinical and operational risks associated with shortages, leading to fragmented and inconsistent prioritization of product allocation.	Jurisdictions compete with each other to procure products in shortage from their suppliers (e.g., manufacturers and distributors). Suppliers allocate products based on contract terms, which do not consider risks to patients. Risk assessment enables leaders to consider the severity of risks and their impact on the health system capacity to deliver care to patients across all jurisdictions and populations.
Collaborative governance strategy	There is no formal authority or designated leadership role that is accountable for managing product disruptions that impact multiple jurisdictions across Canada.	Currently, every jurisdiction manages supply shortages independently with no forum or framework to engage leaders to coordinate supply management across jurisdictions. Suppliers to respond to 13 unique jurisdictions to manage the competing demands and diverse processes. This feature establishes a single entity or agency with accountability for leading coordination of supply management disruptions with clearly defined roles with responsibility for managing multi-jurisdictional collaboration.
Stockpile management	Fragmented and disparate inventory management systems have resulted in limited data to identify products in stockpiles or track product expiry dates to reduce the risk of waste. Stockpiles in each jurisdiction are unknown to other jurisdictions, which limits the use of products in stockpiles to manage risks to patients.	Collaboration across jurisdictions enables a "Whole Canada" approach to manage stockpiles, and inform decisions to manage product shortages across jurisdictions, based on risk to patients, the workforce and health system capacity to deliver care. A collaborative approach to identifying products on hand, knowing where they are located and determining patients with the greatest need informs decisions to procure and distribute products to jurisdictions at the highest risk. Collaborative supply management increases economies of scale to strengthen Canada's influence with global suppliers of health products. Transparent tracking of stockpile inventories also reduces waste due to expiry of products.
Policy barriers	Policy barriers between jurisdictions cause delays in regulatory approval of alternative products needed during shortages. Diverse policy requirements in each jurisdiction create barriers to collaboration, particularly for suppliers who must manage multiple and diverse regulatory requirements of different jurisdictions. When products are recalled due to safety risks, suppliers are accountable for the removal of recalled products, yet few health systems have the digital infrastructure to locate recalled products for removal.	Multi-jurisdictional collaboration proactively identifies legal, logistical and policy barriers across jurisdictions to enable risk mitigation strategies and problem solving by collaborating to increase responsiveness to supply shortages and avoid delays in securing products for patient care.

MJCF = Multi-Jurisdictional Collaboration Framework.

Together, these key features informed the design of the MJCF (Figure 1) to support and guide collaboration across jurisdictions to strengthen proactive management of supply shortages that prioritizes a "Whole Canada" strategy, focused on risks to patients, the workforce and the capacity of health systems to deliver care. The framework supports coordinated leadership, improved data sharing to inform supply management decisions and a shared "Canada First" supply chain strategy that is resilient and responsive to supply disruptions to protect the sustainability and resilience of Canada's health systems.

FIGURE 1.
The proposed MJCF



MJCF = Multi-Jurisdictional Collaboration Framework.

Simulation testing of the MJCF

To assess the framework's feasibility and practical utility, a simulation-based pilot test was developed using a real-world case scenario of a significant supply shortage of epidural catheters. The simulation case was based on a national shortage of epidural catheters, which took place in 2022 and disrupted surgical and obstetrics care across Canada (Leathong and Jones 2022; WHO 2025). The simulation exercise was led by a provincial health services agency and conducted virtually via Microsoft Teams.

Thirty-two participants were recruited using purposive sampling. Participants represented key sectors and jurisdictions, including provincial supply chain agencies, health system leaders from three provinces, industry representatives, a federal health agency, a national pharmacy chain and the SCAN Health research team. All participants had direct experience in healthcare supply chain management or policy implementation. During the three-hour simulation, participants reviewed a detailed case scenario describing the shortage of epidural catheters and were guided through a five-step protocol: (1) scenario introduction; (2) risk assessment; (3) information sharing and situational awareness of the impact of the shortage; (4) response coordination and decision-making; and (5) evaluation of the framework and supply management outcomes. The simulation pilot aimed to test how well the MJCF supported coordinated and collaborative decision-making, knowledge sharing and equitable allocation of product strategies across jurisdictions. A simulation methodology was applied using a structured scenario-based protocol to assess the framework's feasibility, incorporating facilitated group discussions, real-time decision-making exercises and a post-simulation evaluation to capture participant insights and validate the framework's practical utility.

Data collection and analysis

All co-design and simulation sessions were recorded with participant consent. Audio recordings were transcribed verbatim. Thematic analysis was conducted to evaluate how the framework was designed to enable collaboration, aligned with participant priorities during the simulation (Clarke and Braun 2017). Transcripts were coded by the SCAN Health research team using an inductive approach. Coding frameworks were refined iteratively through team discussion and consensus, enhancing the credibility and trustworthiness of the analysis (Nowell et al. 2017).

The study received ethical approval from the University of Windsor Research Ethics Board (REB# 24-238). All participants provided informed consent, and all identifying information was removed during analysis to protect confidentiality.

Results

The simulation exercise revealed three core themes that demonstrated how the MJCF addressed critical gaps in Canada's management of supply disruptions. These themes emerged from participants' experiences testing the framework during a simulated epidural catheter shortage and reflect the use of the MJCF to overcome Canada's fragmented approach to supply disruptions.

Theme 1: Unified national coordination – "making Canada whole"

Participants consistently identified the absence of a national coordination mechanism as a critical barrier to effective supply chain management during supply disruptions. The urgent need for unified coordination was captured most powerfully in one participant's direct question that became central to the discussion:

> Like, who? Who will make Canada whole? (Provincial procurement expert)

This question reflected the broader frustration with Canada's fragmented approach, where jurisdictions act independently and often compete against each other. Participants repeatedly emphasized how this competitive stance undermines Canada's collective bargaining power:

> You know, from my experience in these types of situations, what generally happens is, in our own organizations, we all reach out to the supplier at the same time ... then we all start looking for functional equivalents at the same time ... we should look at this as a way [to find] a better way we can communicate and work collaboratively ... that might make things work a little bit faster, and also that partnership approach. (Provincial procurement leader)

The framework's potential to transform this competitive dynamic was evident in participants' recognition that unified leadership could overcome structural barriers, such as licensing alternative products, that individual jurisdictions cannot address independently:

> When you have national shortages, it's removing barriers to licensing or access to [a] product that is coming [but] has not been licensed yet through Health Canada. We have come across those barriers before. There are options out there. It is just how to get our hands on them, and sometimes those options need to go through some licensing. (Provincial procurement leader)

Participants stressed the urgent need for established processes that could be activated immediately when supply disruptions occur:

> We need a good process. We need a good model to follow when the ball drops, and we all know it will at some point soon. (Provincial procurement leader)

Participants also recognized the need to leverage existing infrastructure that engages multiple jurisdictions:

> I would say Health Canada's Critical Shortages Committee is probably a good starting point because many of us are on that committee already ... we meet regularly once a month. We all know each other. If we need to mobilize quickly, we already have a community of people who talk to each other regularly on critical shortages. (Provincial clinical expert)

Theme 2: Building trust and transparency across jurisdictions

Participants identified that true visibility of product inventories emerges through collaborative relationships and trust building, not merely through technological solutions, and this level of trust is essential for coordinated decision-making across jurisdictions and equitable supply resource allocation. While participants acknowledged the potential value of technological solutions, they emphasized that collaboration is fundamentally about sharing data, insights and relationships:

> Centralizing that effort – what would it look like if there was a national dashboard of some kind? Where, in real time or even on staggered timing, that effort is consolidated and posted? (Provincial procurement leader)

The simulation revealed how this lack of visibility creates inefficiencies and exacerbates shortages through duplicative efforts. Participants recognized that suppliers also benefit from greater visibility and coordination among jurisdictions:

> The more open and coordinated teams are, the more open and easier for suppliers to manage the shortage and to respond to jurisdictions in need. (Healthcare product supplier)

The transformative potential of collaboration was captured in participants' recognition that shared information fundamentally changes the approach to shortage management:

> With [a] national dashboard, it is a totally different mindset. It is like everybody needs [a] product. Let us get all together and figure out how. It is a very, very different level of thinking. (Provincial clinical expert)

Participants determined that accountability for collaboration requires policy-level commitment and formal accountability structures:

> It has to be [a] policy, and it has to be written into each individual healthcare authority policy, that [in] such database, each healthcare authority takes responsibility to contribute to the database, to update information and only to use that information. (Provincial clinical expert)

Theme 3: Risk-informed supply management and patient-centred decision-making

This theme describes the need to ensure clinical expertise and patient impact inform supply chain decision-making. Participants identified significant variability in how "risk" is defined across organizations and emphasized that procurement decisions must prioritize patient safety and clinical outcomes over organizational or financial considerations. The simulation revealed significant challenges in how risk is conceptualized and assessed across different stakeholder roles and organizations.

> When we do a risk register in the past, you look at all the various components of risk. There is risk for the institution. There is risk for the patient. There is risk for the people that seem involved. You have to look at what are the aspects of risk and then what is the impact? (Physician)

The critical importance of clinical expertise in supply management decisions became evident when procurement teams struggled to assess the true impact of the epidural catheter shortage without the clinical expertise needed to fully understand risks among unique patient populations:

> So, did I characterize it right anyway? I mean, if there is no epidural catheter, you may perform higher numbers of C-sections. That is what I heard two years ago. Is that still true? (Provincial procurement expert)

When clinical voices weighed in on the discussion, the impact on patients and potential risks came under the spotlight and fundamentally reshaped decisions.

> The impact to mothers who are expecting to have pain control, who now are managing a labour without an epidural, is significant ... It does not account for the significant toll it is putting on mothers who are labouring without adequate anesthesia. (Physician)

Participants determined that clinical considerations must drive decisions to allocate supplies to patients at the highest risk, and the collaboration framework should prioritize patient need over organizational capacity or purchasing power:

> The motivating factor for me is that the product – whatever is left – will get to those who are most in need. (Provincial procurement leader)

The integration of clinical expertise into supply chain decision-making was recognized as essential for accurate assessment of risk and effective risk mitigation strategies, with participants emphasizing the need for clinical input in developing alternative product strategies and upstream planning. Patient care must remain the central focus of all supply chain decisions, with participants recognizing that clinical needs should drive procurement and allocation strategies, rather than organizational convenience or purchasing power.

Discussion

The federated structure of Canada's healthcare systems presents a structural challenge to Canada's capacity to effectively manage supply disruptions, which are increasing in duration and frequency. While provincial authority and autonomy to manage healthcare supports individualized approaches to managing supply disruptions, the absence of a formal strategy to coordinate efforts, informed by collective decision-making, was repeatedly identified as a critical gap in Canada's capacity to effectively manage supply disruptions. One participant asked, "Who will make Canada whole again?" while others underscored the importance of using federal infrastructure that already exists, with many key people at the table, such as the Health Canada Critical Shortages Committee. While current FPT committees support

important advisory and information-sharing functions, the simulation highlighted the recognition among leaders that greater operational capacity for coordinated action and collaborative decision-making was needed to better manage supply disruptions. The proposed MJCF offers a governance model that builds on the existing FPT committee structure and cultivates collaboration across jurisdictions to collectively manage the challenges of supply disruptions for Canada. The role of federal agencies (e.g., Health Canada, Public Health Agency of Canada, Health Emergency Readiness Canada) may be optimal for coordinating the integration of FPT committees to enable collaboration across jurisdictions that does not currently exist today (Beaulieu et al. 2022; Cameron-Blake et al. 2021).

The need for increased visibility of supply inventory data through shared digital infrastructure is needed to inform collaborative efforts to improve risk mitigation strategies. This finding identifies real-time visibility into inventory, procurement activity and stockpile data as foundational to effective supply chain resilience (CIHI 2024; Laing and Westervelt 2020; Medtech Canada 2021). Visibility is not simply a technical function, but a product of collaboration and trust across teams and leaders of health systems. Bringing together multiple stakeholders through structured collaboration and dialogue, informed by data, enables jurisdictions to share insights and expertise that build the relationships and mutual accountability necessary for coordinated and collaborative responses to supply disruptions for all Canadians.

Variation in key stakeholder perspectives on risk linked to product shortages was often missing during disruptions and decisions on supply management were made without the clinical expertise needed to accurately identify risks to patients, resulting in supply chain teams prioritizing organizational needs, rather than patient safety needs. This concern is echoed in the literature, particularly during the COVID-19 pandemic, where the absence of clinical voices in allocation decision-making led to supplies not being prioritized for the most vulnerable populations (Amoak et al. 2024; Brophy et al. 2020; Snowdon and Saunders 2021). The simulation underscored the value of tools that elevate clinical urgency and workforce impact when determining how scarce products should be distributed to those at highest risk, and the need for clinicians who must be at decision-making tables for effective and equitable management of supply shortages. Integrating clinical judgment into collaboration across jurisdictions enables early identification of risks to patients, the health workforce and health system capacity to deliver quality care. Product distribution that prioritizes those in greatest need rather than those with greater purchasing power or institutional leverage is foundational to this framework (Brophy et al. 2020; Snowdon et al. 2024).

These findings provide both practical and theoretical contributions to the literature on healthcare supply chain resilience. Where previous strategies have focused on post hoc mitigation (Snowdon et al. 2022), the framework embeds resilience planning into routine governance, with infrastructure that supports early warning, equitable allocation and collaborative leadership. The simulation not only validated the framework's design features but also demonstrated that health leaders are eager for a structured, repeatable process that enables real-time coordination and collaboration across jurisdictions to achieve a "Canada First" approach to supply management during product disruptions.

The MJCF offers a systems-level solution to overcome the structural fragmentation and competition across jurisdictions to adequately prioritize allocation of critical supplies to patients in greatest need. It responds to key gaps identified in both the literature and lived experiences of simulation participants, offering a scalable and actionable model for collaboration to advance supply chain resilience across Canada. As shortages become more frequent and complex, this framework offers an actionable roadmap that mobilizes a "Whole Canada" approach to build resilient, equitable and clinically informed supply chain responses that better safeguard patients, clinicians and health system capacity to deliver quality care to Canadians.

Conclusion

This study describes how a co-designed MJCF can address supply chain fragility, including siloed governance, limited supply chain data and the absence of clinically driven risk assessments to inform management of supply shortages. By operationalizing a multi-jurisdictional collaboration strategy, with clearly defined roles, accountabilities, trust, data sharing mechanisms and equitable supply management, the framework offers a practical, scalable solution to advance supply chain resilience for Canada.

Grounded in stakeholder expertise, the framework reflects the realities of Canada's federated health systems while providing the tools necessary for collective action. The implementation of this framework requires a national governance strategy or agency to serve as the coordinating body. This entity would oversee jurisdictional collaboration, facilitate shared decision-making and ensure real-time, equitable and proactive responses to supply disruptions. As product shortages become increasingly complex and systemic, the need for national coordination is no longer optional; in fact, it is essential for action to "Make Canada Whole" through advancing a sustainable solution to supply resilience that prioritizes the health of every Canadian and the capacity of health systems to

meet the health needs of Canadians well into the future. HQ

References

Aguero, D. and D. Allen. 2024. Weathering The Storm: Commentary on the Hurricane Helene IV Fluid Shortage. *Journal of Pediatric Pharmacology and Therapeutics* 29(6): 667–9. doi:10.5863/1551-6776-29.6.667.

Allin, S., G. Marchildon and A. Peckham. 2020, December. The Canadian Health Care System. In R. Tikkanen, R. Osborn, E. Mossialos, A. Djordjevic and G. Wharton, eds., *International Profiles of Health Care Systems* (pp. 27–35). The Commonwealth Fund.

Amoak, D., S. Dhillon, E. Batung, R. Antabe and Y. Sano. 2024. PPE Shortages and Healthcare Workers' Mental Health during the COVID-19 Pandemic in Canada. *Canadian Geographies* 69(1): e12970. doi:10.1111/cag.12970.

Barrett, J. 2019, October 21. Vincristine Drug Shortage Stirs Concern for Impact on Pediatric Patients With Cancer. *Pharmacy Times*. Retrieved June 1, 2025. <https://www.pharmacytimes.com/view/vincristine-drug-shortage-stirs-concern-for-impact-on-pediatric-patients-with-cancer>.

Bate, P. and G. Robert. 2006. Experience-Based Design: From Redesigning the System Around the Patient to Co-Designing Services With the Patient. *BMJ Quality and Safety* 15(5): 307–10. doi:10.1136/qshc.2005.016527.

Beaulieu, M., J. Roy, C. Rebolledo and S. Landry. 2022. The Management of Personal Protective Equipment During the COVID-19 Pandemic: The Case of the Province of Quebec. *Healthcare Management Forum* 35(2): 48–52. doi:10.1177/08404704211053996.

Brend, Y. 2022, November 4. Shortage of Children's Pain Relievers Is Crowding the ER — But There Are Solutions, Doctors Say. *CBC News*. Retrieved June 1, 2025. <https://www.cbc.ca/news/canada/shortage-medication-pain-relief-cold-flu-kids-tylenol-advil-1.6638530>.

Brophy, J.T., M.M. Keith, M. Hurley and J.E. McArthur. 2020. Sacrificed: Ontario Healthcare Workers in the Time of COVID-19. *New Solutions: A Journal of Environmental and Occupational Health Policy* 30(4): 267–81. doi:10.1177/1048291120974358.

Cameron-Blake, E., C. Breton, P. Sim, H. Tatlow, T. Hale, A. Wood et al. 2021, March. Variation in the Canadian Provincial and Territorial Responses to COVID-19. *BSG Working Paper Series*. Retrieved June 1, 2025. <https://www.bsg.ox.ac.uk/sites/default/files/2021-03/BSG-WP-2021-039.pdf>.

Canadian Agency for Drugs and Technologies in Health (CADTH). 2023, March. Optimizing the Use of Iodinated Contrast Media for CT: Managing Shortages and Planning for a Sustainable and Secure Supply. *CADTH Health Technology Review*. Retrieved June 1, 2025. <https://www.ncbi.nlm.nih.gov/books/NBK596309/>.

Canadian Generic Pharmaceutical Association (CGPA) and Canadian Association for Pharmacy Distribution Management (CAPDM). 2025. *A Path Forward: Collaborative Solutions to Strengthen Canada's Drug Supply*. Retrieved June 1, 2025. <https://canadiangenerics.ca/wp-content/uploads/2025/02/02_14_25_CGPA_CAPDM_SUMMIT_REPORT_FINAL.pdf>.

Canadian Institute for Health Information (CIHI). 2024, March. *Pan-Canadian Prescription Drug Data Landscape*. Retrieved June 1, 2025. <https://www.cihi.ca/sites/default/files/document/pan-canadian-prescription-drug-data-landscape-report-en.pdf>.

Canadian Medical Association (CMA). 2020, September 29. Despite Improvements, Over Half of Physicians Continue to Have Issues Accessing Personal Protective Equipment (PPE). Retrieved June 1, 2025. <https://www.cma.ca/about-us/what-we-do/press-room/despite-improvements-over-half-physicians-continue-have-issues-accessing-personal-protective>.

Clarke, V. and V. Braun. 2017. Thematic Analysis. *The Journal of Positive Psychology* 12(3): 297–8. doi:10.1080/17439760.2016.1262613.

Denecke, K., O. Rivera-Romero, G. Giunti, K. Van Holten and E. Gabarron. 2025. Key Components of Participatory Design Workshops for Digital Health Solutions: Nominal Group Technique and Feasibility Study. *Journal of Healthcare Informatics Research* 9: 359–79. doi:10.1007/s41666-025-00199-4.

Dyer, E. 2020. The Great PPE Panic: How the Pandemic Caught Canada With Its Stockpiles Down. *CBC News*. Retrieved June 1, 2025. <https://www.cbc.ca/news/politics/ppe-pandemic-covid-coronavirus-masks-1.5645120>.

Global Affairs Canada. 2024, June. Canada's State of Trade 2024: Supply Chains. Government of Canada. Retrieved June 1, 2025. <https://international.canada.ca/en/global-affairs/corporate/transparency/reports-publications/chief-economist/state-trade/2024>.

Health Canada. 2025a, March. Drug Shortages in Canada. Government of Canada. Retrieved June 1, 2025. <https://www.canada.ca/en/health-canada/services/drugs-health-products/drug-products/drug-shortages.html>.

Health Canada. 2025b, March. Medical Device Shortages: Overview. Government of Canada. Retrieved June 1, 2025. <https://www.canada.ca/en/health-canada/services/drugs-health-products/medical-devices/shortages.html>.

Health Canada. 2024, June. Building Resilience: Health Canada's Plan to Address Health Product Shortages, 2024 to 2028. Government of Canada. Retrieved June 1, 2025. <https://www.canada.ca/content/dam/hc-sc/documents/services/drugs-health-products/drug-products/drug-shortages/plan-2024-2028/building-resilience-plan-to-address-health-product-shortages-2024-2028.pdf>.

Health Canada. 2023, December. *What We Heard: Improving Access to Drugs and Other Health Products in Canada*. Government of Canada. Retrieved June 1, 2025. <https://www.canada.ca/content/dam/hc-sc/documents/services/drugs-health-products/drug-products/drug-shortages/what-we-heard-report/what-we-heard-report.pdf>.

Laing, S. and E. Westervelt. 2020. Canada's National Emergency Stockpile System: Time for a New Long-Term Strategy. *CMAJ* 192(28): E810–1. doi:10.1503/cmaj.200946.

Lau, R.S., M.E. Boesen, L. Richer and M.D. Hill. 2024. Siloed Mentality, Health System Suboptimization and the Healthcare Symphony: A Canadian Perspective. *Health Research Policy and Systems* 22: 87. doi:10.1186/s12961-024-01168-w.

Leathong, S. and A.M. Jones. 2022, July 26. Supply Shortage for Epidurals Causing Concern Across Canada. *CTV News*. Retrieved June 1, 2025. <https://www.ctvnews.ca/health/article/supply-shortage-for-epidurals-causing-concern-across-canada/>.

Marchildon, G.P., S. Allin and S. Merkur. 2020. Canada: Health System Review. *Health Systems in Transition* 22(3): 1–194. Retrieved June 1, 2025. <https://iris.who.int/bitstream/handle/10665/336311/HiT-22-3-2020-eng.pdf>.

Medtech Canada. 2021, December. *A Time for Change in Canada's Healthcare Supply Chain Strategy and Practices*. Retrieved June 1, 2025. <https://medtechcanada.org/files/Positional_Papers/1661889942_A%20Time%20for%20Change%20in%20Canada%E2%80%99s%20Healthcare%20Supply%20Chain.pdf>.

Multi-Stakeholder Steering Committee on Drug Shortages in Canada (MSSC). 2017. *Protocol for the Notification and Communication of Drug Shortages*. Drug Shortages Canada. Retrieved June 1, 2025. <https://www.drugshortagescanada.ca/files/MSSC_Protocol_2017.pdf>.

Nowell, L.S., J.M. Norris, D.E. White and N.J. Moules. 2017. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods* 16(1): 1–13. doi:10.1177/1609406917733847.

Public Health Agency of Canada (PHAC). 2017, October 31. *Federal/Provincial/Territorial Public Health Response Plan for Biological Events. Government of Canada*. Retrieved June 1, 2025. <https://www.canada.ca/en/public-health/services/emergency-preparedness-response/public-health-response-plan-biological-events.html>.

Santhireswaran, A., C. Chu, K.C. Kim, E. Gaudette, L. Burry, F. Clement et al. 2023. *Early Observations of Tier-3 Drug Shortages on Purchasing Trends Across Canada: A Cross-Sectional Analysis of 3 Case-Example Drugs*. *PLoS ONE* 18(12): e0293497. doi:10.1371/journal.pone.0293497.

Snowdon, A.W., C. Ly and A. Wright. 2024. Resilience Among Family Physicians During the COVID-19 Pandemic in Canada. *Healthcare Management Forum* 38(3): 234–40. doi:10.1177/08404704241302717.

Snowdon, A.W., M. Saunders and A. Wright. 2022. The Emerging Features of Healthcare Supply Chain Resilience: Learning From a Pandemic. *Healthcare Quarterly* 25(2): 44–53. doi:10.12927/hcq.2022.26889.

Snowdon, A.W. and P. Forest. 2021. "Flying Blind": Canada's Supply Chain Infrastructure and the COVID-19 Pandemic. *Healthcare Quarterly* 23(4): 12–6. doi:10.12927/hcq.2020.26386.

Snowdon, A.W. and M. Saunders. 2021. COVID-19, Workforce Autonomy and the Health Supply Chain. *Healthcare Quarterly* 24(2): 16–26. doi:10.12927/hcq.2021.26551.

Snowdon, A.W., M. Saunders and A. Wright. 2021. Key Characteristics of a Fragile Healthcare Supply Chain: Learning From a Pandemic. *Healthcare Quarterly* 24(1): 36–43. doi:10.12927/hcq.2021.26467.

Snowdon, A.W. and A. Wright. 2022. Supply Chain Capacity to Respond to the COVID-19 Pandemic in Ontario: Challenges Faced by a Health System in Transition. *Healthcare Management Forum* 35(2): 53–61. doi:10.1177/08404704211057664.

World Health Organization (WHO). 2025. Simulation Exercises. Retrieved June 1, 2025. <https://www.who.int/emergencies/operations/simulation-exercises>.

Zhang, J., C. Mitchell, A. Kushniruk and A. Guitouni. 2022. Facing Disruption: Learning From the Healthcare Supply Chain Responses in British Columbia During the COVID-19 Pandemic. *Healthcare Management Forum* 35(2): 80–5. doi:10.1177/08404704211058968.

About the Authors

Anne W. Snowdon, BScN, MSc, PhD, is the scientific director and chief executive officer of Supply Chain Advance Network (SCAN) Health, an international knowledge translation platform that engages health system leaders and supply chain experts to advance global capacity to adopt and scale best practices in the healthcare supply chain to offer traceability of products and care processes from bench to bedside to patient outcomes. She is a full professor of Strategy and Entrepreneurship at the Odette School of Business, University of Windsor in Windsor, ON. She can be reached by e-mail at anne.snowdon@uwindsor.ca.

Alexandra Wright, PhD, is the research director of SCAN Health, University of Windsor in Windsor, ON. She received her PhD from the Dalla Lana School of Public Health, Institute of Health Policy, Management and Evaluation at the University of Toronto in Toronto, ON.

Saba Ghadiri, B.Eng., MA, is a research analyst at SCAN Health, Odette School of Business, University of Windsor in Windsor, ON.

Cindy Ly, MA, is a research analyst at SCAN Health, Odette School of Business, University of Windsor in Windsor, ON.