



Use of injections for chronic pain from 2010 to 2019 in Ontario, Canada

Utilisation d'injections pour soulager la douleur chronique de 2010 à 2019 en Ontario, Canada

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Abstract

Purpose *The management of chronic pain often involves interventional procedures such as injections. Nevertheless, there have been concerns raised regarding the frequency with which these injections are being performed. We conducted a descriptive study to examine trends in the use of pain injections over a ten-year time period in Ontario, Canada.*

Methods *We used provincial administrative data to conduct a retrospective observational study of the most common pain injections performed from 2010 to 2019 in Ontario. We determined the frequency of pain injections*

and their associated physician billings from physician billing data.

Results *A total of 18,050,058 pain injections were included in this study with an associated total cost of CAD 865,431,605. There was a threefold increase in the number of blocks performed annually and associated costs, rising from 1,009,324 blocks (CAD 50,026,678) in 2010 to 3,198,679 blocks (CAD 156,809,081) in 2019. The majority of injections were performed by general practitioners (70.8%), followed by anesthesiologists (8.3%).*

Conclusion *This descriptive study revealed a rapid increase in the frequency of pain injections performed in Ontario from 2010 to 2019. Given the associated costs and potential risks, this warrants further investigation to ensure that these interventions are being administered appropriately.*

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Résumé

Objectif *La prise en charge de la douleur chronique implique souvent des procédures interventionnelles telles que des injections. Néanmoins, des préoccupations ont été soulevées quant à la fréquence à laquelle ces injections sont administrées. Nous avons réalisé une étude descriptive pour examiner les tendances dans l'utilisation d'injections pour soulager la douleur sur une période de dix ans en Ontario, au Canada.*

Méthode *Nous avons utilisé les données administratives provinciales pour réaliser une étude observationnelle rétrospective des injections pour soulager la douleur les plus courantes effectuées de 2010 à 2019 en Ontario. Nous avons déterminé la fréquence des injections pour soulager la douleur et les facturations des médecins associées à partir des données de facturation des médecins.*

Résultats *Au total, 18 050 058 injections pour soulager la douleur ont été incluses dans cette étude, avec un coût total associé de 865 431 605 CAD. Le nombre de blocs exécutés chaque année et les coûts associés ont triplé, passant de 1 009 324 blocs (50 026 678 CAD) en 2010 à 3 198 679 blocs (156 809 081 CAD) en 2019. La majorité des injections ont été administrées par des médecins généralistes (70,8 %), suivis par des anesthésiologistes (8,3 %).*

Conclusion *Cette étude descriptive a révélé une augmentation rapide de la fréquence des injections pour soulager la douleur et administrées en Ontario de 2010 à 2019. Compte tenu des coûts associés et des risques potentiels, cela justifie une enquête plus approfondie pour s'assurer que ces interventions sont administrées de manière appropriée.*

Keywords chronic pain · nerve blocks · nerve injections · pain interventions

Nearly one in five Canadians will experience chronic pain during their lifetime.¹ Beyond experiencing discomfort, this debilitating condition can have significant detrimental impacts on numerous domains including sleep, function, social relationships, and mental health.² A key therapeutic approach in the management of chronic pain has been the use of interventional therapies such as the injection of a local anesthetic and/or steroid around nerves to interrupt transmission and/or reduce perineural inflammation.³ While pain injections can provide relief, the procedures are not benign and can be associated with significant risks such as nerve damage.⁴ Further, strong evidence to support the widespread use of pain injections is lacking. For example, a systematic review examining the effectiveness

of low-back pain found insufficient evidence to support injection therapy for chronic low-back pain.⁵ Existing trials have also been fraught with limitations such as variations in technique, difficulty blinding, lack of allocation concealment, differential dropout rates, and heterogeneity of patient pain presentations.^{6–8}

Thus, the existing literature to date provides little guidance about which patients will benefit from these injections and the frequency with which they should be administered. Recent reports have raised questions about the high frequency of these procedures being performed in the province of Ontario, Canada.^{9,10} We therefore sought to conduct a descriptive study examining the use of injections for chronic pain over a ten-year time period.

Methods

We conducted a retrospective observational study of pain injections performed in Ontario, Canada from 1 January 2010 to 31 December 2019. Data were obtained from ICES (formerly the Institute for Clinical and Evaluative Sciences), which is an independent, non-profit research institute whose legal status under Ontario's health information privacy law allows it to collect and analyze healthcare and demographic data, without consent, for health system evaluation and improvement. We used physician billing data from the Ontario Health Insurance Plan (OHIP) to identify the number of pain injections administered by physicians. To ensure that only outpatient injections were captured, we excluded records that were billed during a hospitalization or if the physician administering the injection did not have any outpatient OHIP claims in 2019. Patient records with a missing or invalid age or sex and those associated with non-Ontario residents or those with a physician who was out of province or could not be linked to Ontario databases were also excluded.

To determine which set of injections for chronic pain should be included in the analysis, we first conducted a literature search to identify potential billing codes used in previous studies, resulting in a total of 65 codes. Two individuals with expertise and experience in chronic pain management (K. L. and H. C.) independently reviewed these codes and excluded codes related to obstetrics and surgery, resulting in 57 codes typically used in the management of chronic pain. We then divided the top 15 codes of this group (accounting for > 95% of all billings) into three categories based on region: axial/back, facial, and peripheral/extremity. A list of codes considered in this study can be found in Electronic Supplementary Material (ESM) eTable 1.

We tabulated the overall number of pain injections performed and their associated costs from physician billings over the study period. For the final year of the study (2019), we derived several additional metrics including the number of injections performed per patient, and the distribution of injections across physician specialties.

Results

A total of 18,388,171 pain injections were administered over the ten-year study period, and after exclusions 18,050,058 were included in this study (ESM eFigure). The associated total cost was CAD 865,431,605. There was a threefold increase in the number of blocks performed annually and their associated costs, rising from 1,009,324 blocks (CAD 50,026,678) in 2010 to 3,198,679 blocks (CAD 156,809,081) in 2019 (Table 1; Figure). The proportion of pain injections administered varied by injection type, with injections of extremities and other peripheral/myofascial blocks being responsible for 58.2% of all injections administered in 2019 (1,860,359 of 3,198,679) and 46.3% of total costs (CAD 72,618,063 of CAD 156,809,081; Table 1). A breakdown of the number of injections and costs for each billing code is presented in ESM eTable 2a–c.

In 2019, 312,828 patients received a chronic pain injection, the majority of whom (298,065, 95.3%) received at least one block of an extremity or other peripheral/myofascial block (Table 2). The median [interquartile range (IQR)] number of injections

administered per patient in 2019 was 2 [1–3]; however, 10.6% of patients received more than 11 injections in 2019. These injections took place during a median [IQR] of 1 [1–2] visit, with 5.4% of patients having more than 11 visits for blocks. The number of visits per patient varied by type of injection, with 40.5% of patients receiving more than 11 visits for facial injections versus 4.9% for peripheral injections. General practitioners performed the majority of injections (70.8%), followed by anesthesiologists (8.3%), although this varied by injection type, with 84.1% of facial nerve blocks being administered by general practitioners and 11.4% of axial/back blocks being administered by anesthesiologists. The median [IQR] number of injections per physician who administered injections in 2019 was 12 [3–44]. Nevertheless, when broken down by type of injection, this was much higher among physicians administering axial/back injections (median [IQR] per physician annually, 239 [8–1,971]) and facial injections (median [IQR] per physician annually, 283 [10–1,110]).

Discussion

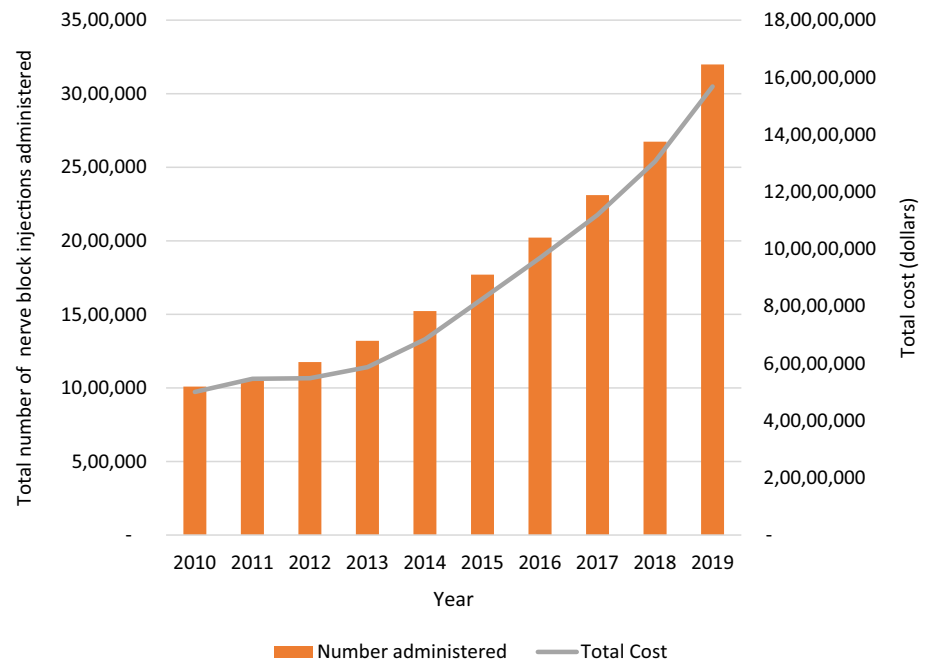
This descriptive study revealed a threefold increase in the administration of injections to manage chronic pain in Ontario over the ten-year period from 2010 to 2019. Further, the cost of physician billings for these injections totalled nearly 900 million CAD. Importantly, these data represent only the 15 most common procedures, and excluded costs for injections administered by salaried physicians (~5% of all injections), meaning that the true

Table 1 Summary of injections performed and associated physician billings over the study time period

Year	Overall*		Axial/back		Facial		Extremity/other peripheral/myofascial	
	Number administered	Total cost (CAD)	Number administered	Total cost (CAD)	Number administered	Total cost (CAD)	Number administered	Total cost (CAD)
2010	1,009,324	50,026,678	353,432	25,439,246	91,922	12,104,154	563,970	12,483,278
2011	1,046,868	54,596,540	364,261	27,144,659	93,439	12,580,769	589,168	14,871,112
2012	1,176,258	54,832,399	420,983	25,391,762	116,946	12,952,071	638,329	16,488,567
2013	1,320,284	58,708,159	471,817	24,676,184	143,755	14,471,190	704,712	19,560,785
2014	1,522,238	68,431,300	530,617	27,218,957	170,724	17,113,401	820,897	24,098,943
2015	1,769,884	82,589,805	602,199	31,020,084	198,961	19,964,698	968,724	31,605,023
2016	2,021,574	96,890,770	677,507	35,032,538	224,485	22,724,615	1,119,582	39,133,617
2017	2,310,921	111,937,437	773,679	39,831,765	252,509	25,723,676	1,284,733	46,381,996
2018	2,674,028	130,609,435	855,616	43,363,893	288,246	28,983,863	1,530,166	58,261,679
2019	3,198,679	156,809,081	999,076	50,026,900	339,244	34,164,119	1,860,359	72,618,063

*990,396 (5.5%) claims over the entire study period had CAD 0 associated with the claim (this is mainly due to shadow billing when physicians are paid a salary); therefore, total costs are undercounted

Figure Trend of nerve block injections and associated costs over the study period



number of injections and resultant costs are likely much greater. We also found that these patterns were not consistent across injection types and physician specialty, with the majority of the injections being administered to extremities and being performed by general practitioners, and a large proportion of patients undergoing multiple injections per year.

Injections are widely considered to be an important tool in the management of chronic pain and have been used for decades. Nevertheless, there has been no significant change in the evidence base surrounding their role in pain management to explain their increased use. While data are sparse elsewhere in Canada, a study in the USA among Medicare recipients reported an annual 2.5% decline in the rate of epidural injections for chronic pain from 2009 to 2018.¹¹ This suggests that there are factors particular to Ontario that have led to the rise of these interventional pain procedures.

Although the underlying drivers of the increase in injections found in our study cannot be discerned from our data, there are a few potential explanations. First, the increase could represent better access to interventional pain therapies, with these trends representing a positive development for patients with chronic pain. On the other hand, the growth in injections could represent an overuse of these procedures as a response to financial incentives tied to physician reimbursement in Ontario.⁹ Importantly, these interpretations are not mutually exclusive and determining the balance of access to care against inappropriate administration is difficult to do using administrative health data. One previous study based in Ontario, which

examined the impact of paravertebral blocks, showed an increase in resource use and no change in opioid use following the procedure.¹⁰ While this suggests limited added value from these procedures, studies with administrative data could be prone to confounding by indication making it difficult to assert causality.¹² Therefore, to answer this question, granular data from multiple providers on both procedures and patient outcomes such as pain intensity, pain interference, and side effects is required. Indeed, expanding data collection related to chronic pain interventions has been deemed a crucial step towards improving health system quality by the Canadian Pain Task Force.¹

The study has several limitations, which should be noted when interpreting the data. First, the study relied on billing codes, which may or may not be reflective of the actual procedure performed. Further, the same procedure can be performed in different ways, e.g., with or without imaging guidance. Additionally, overall healthcare use was not considered. Thus, the costs calculated in this study may not be significant if healthcare expenditures were decreased as a result of the injection, e.g., fewer presentations to the Emergency Department for pain. Future studies that examine healthcare use and pain medication use at the individual level with a comparator group are needed to characterize the impact of injections at the patient and system levels.

While the exact cause of the increase in chronic pain injections in Ontario is unknown, the sheer number of procedures in 2019, alongside their rapid growth and associated costs over the last decade, indicate that further

Table 2 Distribution of chronic pain injections administered to patients and by physician specialty in 2019

	Overall	Axial/back	Facial	Extremity/other peripheral/ myofascial
Total number of injections administered, <i>N</i>	3,198,679	999,076	339,244	1,860,359
Total cost of injections (CAD)	156,809,081	50,026,900	34,164,119	72,618,063
Total number of patients receiving injections, <i>N</i>	312,828	51,503	20,520	298,065
Number of injections per patient per year, <i>n</i> (%)				
1	148,404 (47.4%)	7,950 (15.4%)	2,942 (14.3%)	145,436 (48.8%)
2	71,050 (22.7%)	6,374 (12.4%)	2,057 (10.0%)	70,909 (23.8%)
3–5	43,750 (14.0%)	8,789 (17.1%)	3,326 (16.2%)	40,741 (13.7%)
6–10	16,441 (5.3%)	7,258 (14.1%)	3,188 (15.5%)	15,751 (5.3%)
11+	33,183 (10.6%)	21,132 (41.0%)	9,007 (43.9%)	25,228 (8.5%)
<i>Number of injections per patient per year, median [IQR]</i>	2 [1–3]	6 [2–24]	8 [3–22]	2 [1–3]
Number of injections per patient per day, median [IQR]	2 [1–5]	2 [1–3]	1 [1–1]	2 [1–3]
Visits (unique days) for injections per patient per year, <i>n</i> (%)				
1	190,139 (60.8%)	11,954 (23.2%)	3,322 (16.2%)	186,710 (62.6%)
2	57,195 (18.3%)	6,772 (13.2%)	1,977 (9.6%)	54,705 (18.4%)
3–5	38,265 (12.2%)	11,265 (21.9%)	3,645 (17.8%)	33,289 (11.2%)
6–10	10,450 (3.3%)	7,024 (13.6%)	3,262 (15.9%)	8,661 (2.9%)
11+	16,779 (5.4%)	14,488 (28.1%)	8,314 (40.5%)	14,700 (4.9%)
<i>Number of visits (unique days) for injection per patient per year, median [IQR]</i>	1 [1–2]	4 [2–12]	7 [2–19]	1 [1–2]
Number of physicians administering injections	8,414	594	397	8,318
<i>Number of injections per physician per year, median [IQR]</i>	12 [3–44]	239 [8–1,971]	283 [10–1,110]	12 [3–42]
<i>Number of injections per physician per day, median [IQR]</i>	2 [1–6]	18 [6–37]	8 [4–15]	2 [1–5]
Number of injections administered by physician specialty, <i>n</i> (%)				
Anesthesiology	264,396 (8.3%)	113,692 (11.4%)	20,548 (6.1%)	130,156 (7.0%)
Emergency medicine	122,760 (3.8%)	41,146 (4.1%)	14,847 (4.4%)	66,771 (3.6%)
General practitioner	2,265,601 (70.8%)	758,057 (75.9%)	285,119 (84.1%)	1,222,425 (65.7%)
Orthopedic surgery	186,982 (5.8%)	20,088 (2.0%)	1,125 (0.3%)	165,769 (8.9%)
Rheumatology	93,524 (2.9%)	173 (0.0%)	0	93,351 (5.0%)
Other	265,416 (8.3%)	65,920 (6.6%)	17,605 (5.2%)	181,891 (9.8%)

investigation into these trends is warranted. Given limited healthcare resources, it is imperative that policy makers appropriately allocate funding to effective interventions to ensure that chronic pain patients receive the best possible care. Unlike chronic pain injections, many other evidenced-based components of multimodal chronic pain therapy such as acupuncture, physical therapy, and psychotherapy are not routinely covered by provincial health plans. Further research is needed to determine the

appropriateness and utility of chronic pain injections for individual patients in a manner that does not compromise access to care for those who benefit from these procedures.

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