IHE Report

A study of healthcare utilization in patients with chronic low back pain using Alberta's administrative health data

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A study of healthcare utilization in patients with chronic low back pain using Alberta's administrative health data

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SUDA project: This report is part of the Secondary Use Data Access (SUDA) initiative, a collaboration between the Government of Alberta (GOA) and industry that is facilitated by the IHE. The goal of the initiative is to accelerate health research, support innovation, and strengthen the health system through insights from analysis of health data. The IHE is serving as a partner to the GOA to strengthen analytic capacity and foster collaboration between the GOA, industry, and other contributors.

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Competing interest is considered to be financial interest or non-financial interest, either direct or indirect, that would affect the research contained in this report or create a situation in which a person's judgement could be unduly influenced by a secondary interest, such as personal advancement.

The authors of this publication claim no competing interest.

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Executive Summary

This study examined the temporal trends of healthcare service and medicine utilization and explored the care quality of patients with chronic low back pain (CLBP) by assessing inappropriate use of medicine, using Alberta's administrative health data from 1 April 2011 to 31 March 2018 (fiscal years [FY] 2011/12 to 2017/18).

The prevalence of CLBP in Alberta increased from 1.8% FY 2011/12 to 3.0% in FY 2017/18, and the number of CLBP patients increased from 72,094 to 145,013 during this period. More female patients were affected by CLBP than male patients. The majority of CLBP patients were in the 40 and 64 years age group (over 50%), followed by the 18 to 39 years age group.

There was a substantial increase in the total healthcare service and medicine utilization by CLBP patients during the observation period. The total number of practitioner claims among the CLBP patients increased from 1.9 million to 4.5 million. The total number of CLBP-related interventional radiology procedures increased from 9,430 to 27,223. The total number of CLBP-related diagnostic imaging examinations (such as x-ray, computed tomography, or magnetic resonance imaging) increased from 13,104 to 17,033. The total number of medicines dispensed increased from 2.5 million to 6.4 million.

The four indicators of inappropriate use of medicine in CLBP management showed different trends. Regarding potential polypharmacy, the proportion of CLBP patients dispensed high numbers of medicines (five or more, and nine or more) increased during the observation period. Regarding doctor shopping for opioids, among CLBP patients with a dispensed opioid prescription, the proportion with multiple opioid prescribers (two or more, and four or more) decreased overall during the observation period. The proportion of CLBP patients with a dispensed opioid prescription who had an opioid-related poisoning diagnosis remained under 0.1%, and very few CLBP patients died from opioid-related causes.

Abbreviations

All abbreviations that have been used in this report are listed here unless the abbreviation is well known, has been used only once, or has been used only in figures or tables, in which case the abbreviation is defined in the figure legend or in the notes at the end of the table.

ABC	Alberta Blue Cross
ACR	Alberta Cancer Registry
AH	Alberta Health
ATC	Anatomical Therapeutic Chemical
CLBP	chronic low back pain
CT	computed tomography
DAD	Discharge Abstract Database
DI	diagnostic imaging
ED	emergency department
FY	fiscal year (from 1 April to 31 March)
ICD	International Classification of Diseases
IR	interventional radiology
MRI	magnetic resonance imaging
NACRS	National Ambulatory Care Reporting System
NSAID	nonsteroidal anti-inflammatory drug
PIN	Pharmaceutical Information Network
SUDA	Secondary Use Data Access

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1. Background

This study was conducted under the Secondary Use Data Access (SUDA) initiative. It aimed to examine the temporal trends of healthcare service and medicine utilization and to explore the care quality in patients with chronic low back pain (CLBP) using Alberta's administrative health data.

2. Study Objectives

The three specific objectives were to:

- estimate the utilization of healthcare services, including practitioner claims, interventional radiology, diagnostic imaging, and dispensed prescription medicines;
- estimate the cost of dispensed prescription medicines in CLBP management; and
- examine indicators of inappropriate use of medicine in CLBP management to estimate care quality, including polypharmacy, doctor shopping for opioids, opioid-related poisoning, and opioid-related mortality.

3. Methods

3.1. Data Sources and Observation Period

Data from the following databases were included for the analyses in this study:

- Alberta Blue Cross (ABC) (pharmacy claims);
- Alberta Cancer Registry (ACR);
- Alberta Practitioner Claims;
- diagnostic imaging (DI) database;
- Discharge Abstract Database (DAD) (inpatient information);
- National Ambulatory Care Reporting System (NACRS);
- Pharmaceutical Information Network (PIN) (dispense information);
- Population Registry; and
- Vital Statistics.

The observation period was seven years between fiscal year (FY) 2011/12 and FY 2017/18 (that is from 1 April 2011 to 31 March 2018). Fiscal years for this analysis ran from 1 April through 31 March (for example, FY 2017/18 is 1 April 2017 to 31 March 2018).

3.2. Cohort Definition

This study had an open cohort design, where patients with CLBP could enter and exit the cohort between FY 2011/12 and FY 2017/18. All CLBP patients were included, regardless of age or sex. Because the time of the first diagnosis could not be accurately identified in the administrative health data, the study relied on a prevalence-based case definition that encompassed all CLBP cases with various severity and stages. A claims-based recurrent low back pain definition was employed.[1] The specific case (*CLBP patient*) identification algorithm was as follows:

a. three (or more) diagnoses of International Classification of Diseases, 9th revision (ICD-9) codes (that is, 720, 721, 722, 724, 846, or 847), in any diagnostic field in the claim records within 365 days; and

b. at least one of the diagnoses in the year (FY) under study.

Descriptions of the above-mentioned ICD-9 codes appear in Appendix A.

Any patient who was diagnosed with any cancer was excluded from the analysis, in order to more reliably attribute the use of healthcare services and medicines to the management of CLBP. Data in the ACR were searched from 1 April 2006 to 31 March 2018, to identify patients who had one (or more) diagnosis of cancer. Data from up to five years before the observation period were included because cancer-related pain can persist for years.

3.3. Healthcare Utilization Variables

3.3.1. Practitioner Claims

The number of CLBP-related claims for the CLBP patients was reported for the observation period. Each record in the Alberta Practitioner Claims database represented a claim. A CLBP-related claim was a claim with a diagnosis related to CLBP, and was defined based on the list of ICD-9 diagnostic codes described above and in Appendix A.

3.3.2. Interventional Radiology

Information about the utilization of interventional radiology (IR) for the CLBP patients was also extracted from the Alberta Practitioner Claims database. IR is a diagnostic or therapeutic procedure that requires imaging to guide an instrument to a precise anatomical region where the intervention is performed. IR includes image-guided lumbar nerve root sleeve (steroid and/or anesthetic) injection and lumbar epidural corticosteroid injection. Appendix B contains a list of interventions included in this study and their corresponding health service codes. IR utilization was expressed in the number of procedures and estimated by the number of records with a relevant health services code in the Alberta Practitioner Claims data.

3.3.3. Diagnostic Imaging

The number of CLBP-related diagnostic imaging (DI) examinations in the patients was reported. DI examinations of the lumbar spine were grouped into three categories: x-ray, computed tomography (CT), and magnetic resonance imaging (MRI). Information was extracted from the DI data, which includes all DI examinations performed in the facilities funded by Alberta Health Services. The data does not include examinations performed at privately operated community clinics. In this study, DI examinations performed during emergency department (ED) visits or hospital stays were excluded from the analysis. Identification of specific CLBP-related DI examinations was based on the Common Procedure and Examination List codes (see Appendix C).

3.3.4. Medicine Utilization

The data sources reported the use of CLBP-related medicines in the number of medicines dispensed. Dispense records were searched in PIN for six drug classes, based on the Anatomical Therapeutic Chemical (ATC) codes. These classes were: nonsteroidal anti-inflammatory drugs (NSAIDs), opioids (narcotics), antidepressants, anticonvulsants, muscle relaxants, and benzodiazepines. Appendix D contains a list of the specific ATC codes included in each class.

3.3.5. Cost of Medicine

The cost of medicine was reported for CLBP patients aged 65 years or above (seniors). Seniors in Alberta have universal prescription drug benefits provided by the Coverage for Seniors program, which included the medicines on the Alberta Drug Benefit List.[2] The program is administered by ABC, and the medicine costs were estimated from the drug cost paid amount information extracted from the ABC dataset; this amount was calculated based on individual and product eligibility. The amount in each claim was summed to provide the total cost at the patient, drug class, and province levels.

3.4. Care Quality Variables

3.4.1. Polypharmacy

"Polypharmacy" implies over-prescription and inappropriate medicine use. This practice poses unnecessary high health risks to patients, as it has an established association with adverse drug reactions, drug–drug interactions, hospitalization, and other negative clinical outcomes.[3] CLBP patients dispensed five or more and nine or more medicines (CLBP- or non-CLBP-related) in each FY during the observation period were reported. The number of medicines was equal to the number of unique level 5 ATC codes recorded in the PIN data for each patient (that is, a method adapted from Statistics Canada).[4]

3.4.2. Doctor Shopping

Individuals engage in "doctor shopping" when they attempt to obtain a controlled substance from multiple healthcare providers without the prescribers' knowledge of other current prescriptions.[5] CLBP patients with dispensed opioids prescribed by (a) two or more prescribers and (b) four or more prescribers were reported. The PIN data supplied information about the number of opioid prescribers (identified by ATC codes). The number of opioid prescribers was a count of unique prescriber identifiers associated with opioid dispensation.

3.4.3. Opioid-Related Poisoning

CLBP patients with dispensed opioids prescriptions who also had one or more opioid-related poisoning diagnoses at an ED visit or during hospital stay were identified from the NACRS and DAD databases. Opioid-related poisoning was identified based on the ICD-10 codes (see Appendix E).

3.4.4. Opioid-Related Mortality

The data sources reported the number of prescription opioid-related deaths in CLBP patients. Based on the Vital Statistics data, an *opioid-related death* was defined as follows: (a) the underlying cause of death related to poisoning and (b) other cause(s) indicated one or more prescription opioids and/or other and unspecified narcotics contributed to the poisoning. Appendix F contains a list of ICD-10 codes associated with these events.

3.5. Statistical Analysis

Healthcare services and medicines utilization in CLBP patients were estimated for the FYs studied, that is, FY 2011/12 to FY 2017/18. Three estimates, where appropriate, were reported for each outcome:

- Alberta total;

- average per CLBP patient by sex; and
- average per CLBP patient by age group.

The five age groups were the following: 0 to 17 years, 18 to 39 years, 40 to 64 years, 65 to 84 years, and 85 years and older. All cost data were adjusted to (and are reported as) 2019 Canadian dollars using the Consumer Price Index. The trends across this seven-year observation period were illustrated graphically.

For the outcomes associated with care quality, the count and proportion were reported. Proportion calculations for doctor shopping, opioid-related poisoning, and opioid-related deaths were restricted to CLBP patients who were dispensed prescribed opioids.

4. Results

4.1. Cohort Characteristics

A total of 363,851 individual CLBP patients were identified from Alberta's administrative health data for the observation period. The majority of these patients did not meet the CLBP definition for the entire seven-year period; only 9,439 (2.6%) individuals were included in the analyses for all FYs in the observation period.

There was a 101% increase in the number of CLBP patients during the observation period, and the estimated prevalence of CLBP also increased. Table 1 shows the number of CLBP patients included in each FY and the estimated prevalence.

TABLE 1: Prevalence of CLBP in Alberta, by fiscal year

	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Number of CLBP patients	72,094	92,857	99,540	106,624	115,324	122,687	145,013
Prevalence	1.8%	2.2%	2.3%	2.4%	2.5%	2.6%	3.0%

CLBP: chronic low back pain; FY: fiscal year

During the observation period, more female patients than male patients had a CLBP diagnosis. Among the CLBP patients, approximately 54% were female and 46% were male; these proportions were relatively consistent over the observation period (see Table 2). The results also indicated that the majority of CLBP patients (approximately 51%) were in the 40 to 64 years age group (see Table 3).

TABLE 2: Distribution of CLBP patients, by sex and fiscal year

Sex	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Female	54.3%	54.5%	54.2%	54.0%	54.0%	53.7%	53.6%
Male	45.7%	45.5%	45.9%	46.1%	46.0%	46.3%	46.4%

CLBP: chronic low back pain; FY: fiscal year

TABLE 3: Distribution of CLBP patients, by age group and fiscal year

Age group	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
<18 years	2.1%	2.0%	1.9%	1.8%	1.8%	1.7%	1.3%
18–39 years	28.1%	27.9%	27.8%	27.3%	26.6%	25.7%	23.6%
40–64 years	51.5%	51.4%	51.4%	51.2%	51.1%	51.2%	51.4%
65–84 years	15.6%	16.1%	16.4%	17.1%	17.8%	18.6%	20.5%
≥85 years	2.7%	2.6%	2.5%	2.7%	2.7%	2.8%	3.1%

CLBP: chronic low back pain; FY: fiscal year

4.2. Healthcare Utilization Variables

4.2.1. Practitioner Claims

Among the CLBP patients in Alberta, the total number of practitioner claims (for any cause) increased more than two-fold during the observation period, from 1.9 million to 4.5 million; however, the proportion that was CLBP-related decreased, from 18.5% to 15.3% (see Table 4).

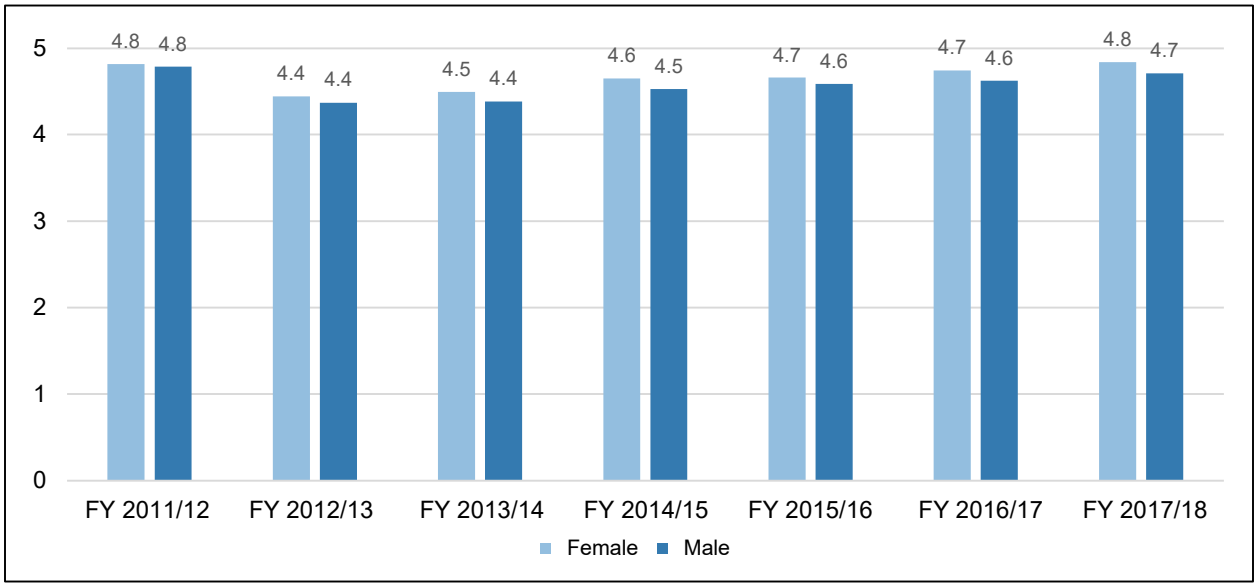
TABLE 4: Total number and distribution of practitioner claims for CLBP patients, by type and fiscal year

	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Total claims	1,874,000	2,355,000	2,599,000	2,897,000	3,294,000	3,590,000	4,541,000
Non-CLBP claims	81.5%	82.6%	83.0%	83.1%	83.8%	84.0%	84.7%
CLBP claims	18.5%	17.4%	17.0%	16.9%	16.2%	16.0%	15.3%

CLBP: chronic low back pain; FY: fiscal year

The mean number of CLBP-related practitioner claims (that is, claims with specific CLBP-related diagnoses) per CLBP patient was relatively stable during the observation period, at approximately 4.6. There were slightly more claims for female patients than male patients (see Figure 1).

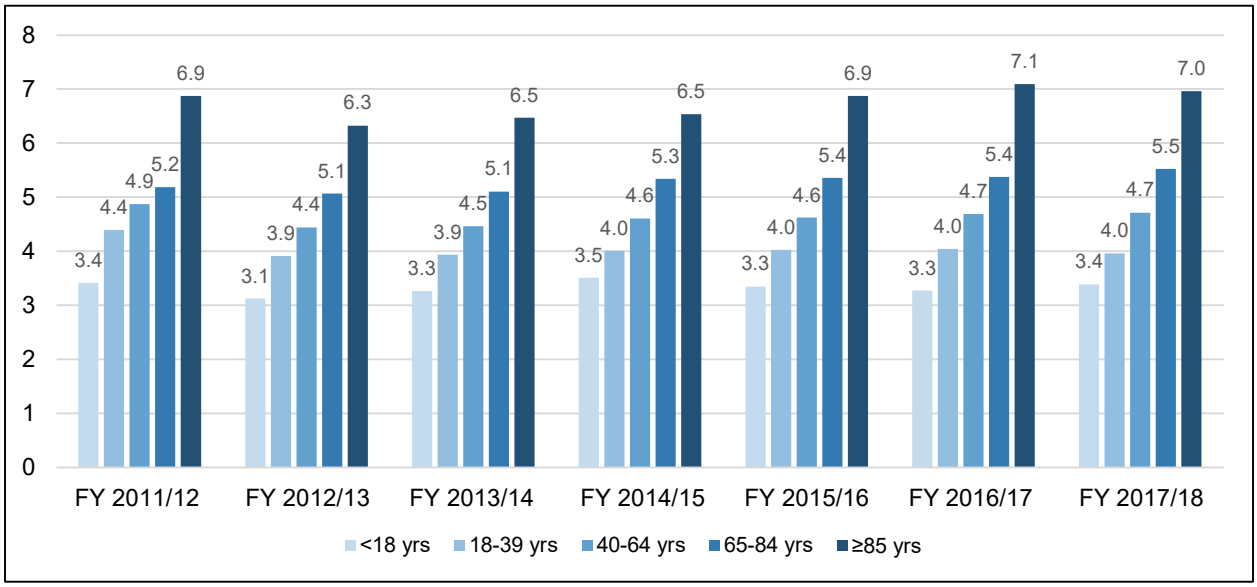
FIGURE 1: Mean number of CLBP-related practitioner claims per CLBP patient, by sex and fiscal year



CLBP: chronic low back pain; FY: fiscal year

The mean number of CLBP-related practitioner claims per CLBP patient was relatively consistent within each age group during the observation period. The results indicate that age had a positive relationship with the mean number of CLBP-related claims (see Figure 2).

FIGURE 2: Mean number of CLBP-related practitioner claims per CLBP patient, by age group and fiscal year



CLBP: chronic low back pain; FY: fiscal year; yrs: years

4.2.2. Interventional Radiology

There was an increasing trend in the number of IR procedures among CLBP patients. During the observation period, the total number of IR procedures increased nearly threefold, from 9,430 to 27,223, an approximately 40% per-FY increase (see Table 5).

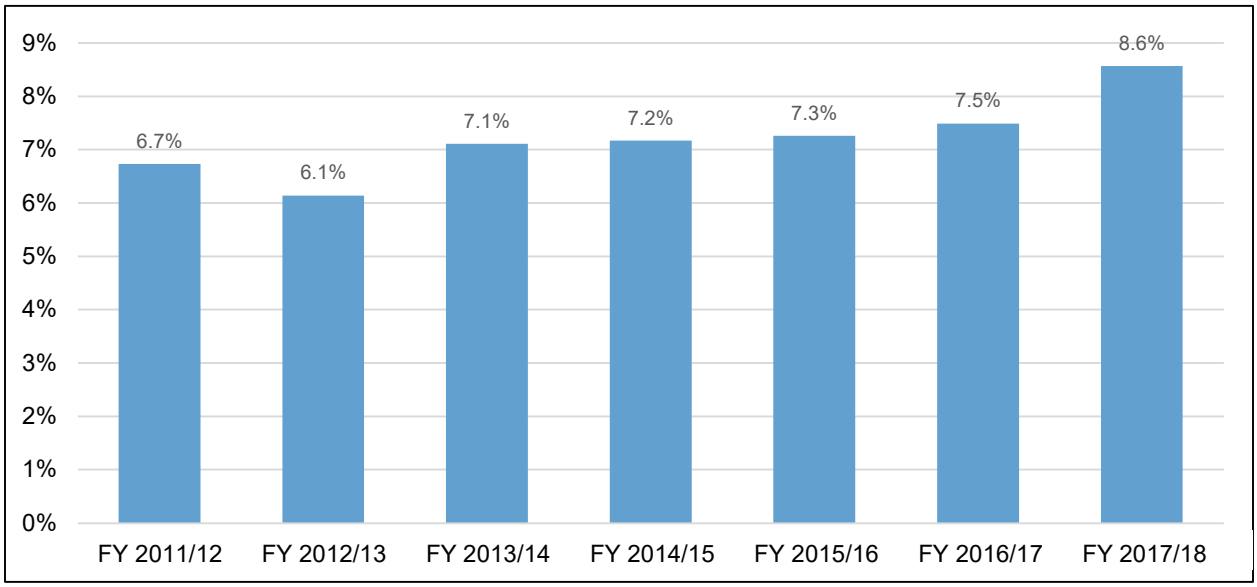
TABLE 5: Total number of IR procedures among CLBP patients, by fiscal year

	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Total IR procedures	9,430	11,148	14,611	16,172	17,815	19,829	27,223

CLBP: chronic low back pain; FY: fiscal year; IR: interventional radiology

While not every CLBP patient had an IR procedure during the observation period, the proportion who had one or more IR procedures increased (see Figure 3).

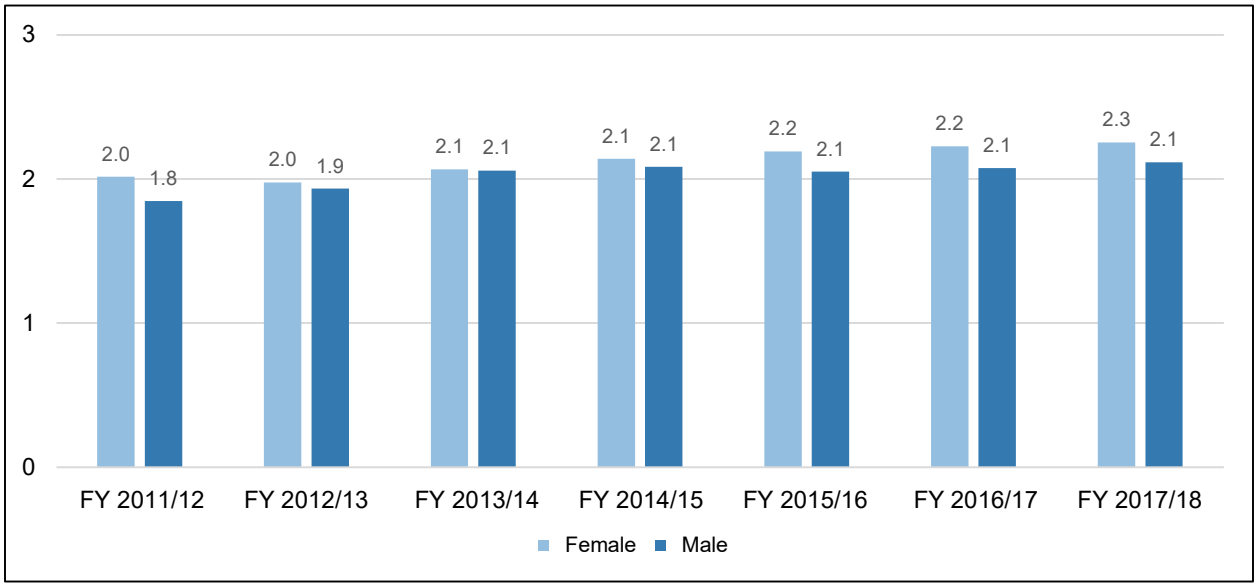
FIGURE 3: Proportion of CLBP patients who had ≥1 IR procedures, by fiscal year



CLBP: chronic low back pain; FY: fiscal year; IR: interventional radiology

For CLBP patients who had one or more IR procedures, the mean number of IR procedures per patient was approximately 2.0, with only a small variation between female and male patients during the observation period (see Figure 4).

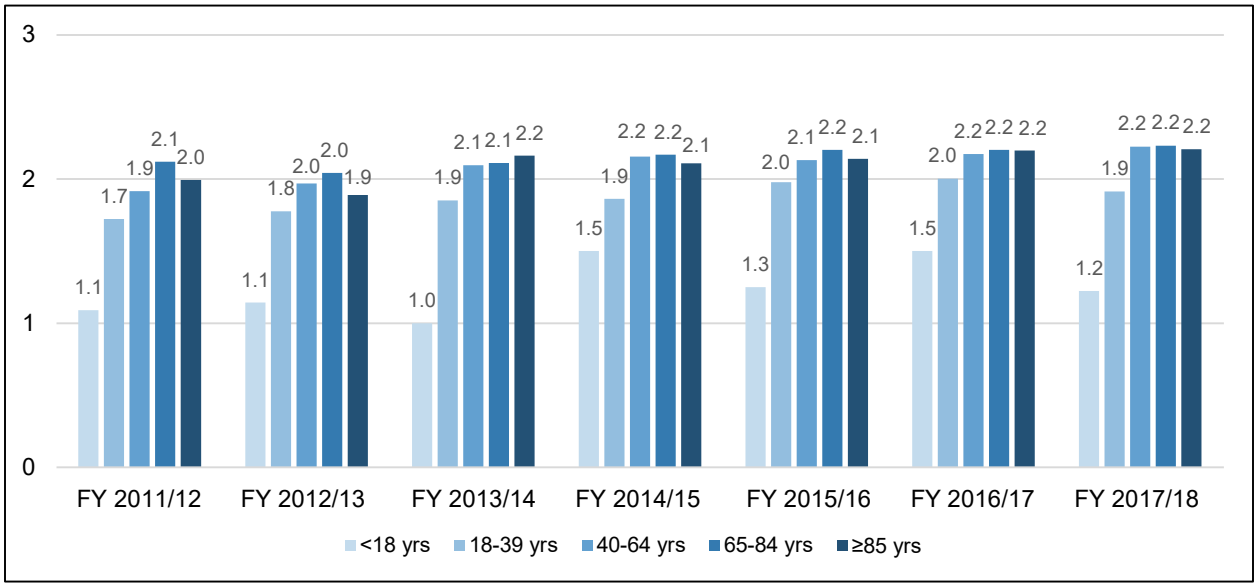
FIGURE 4: Mean number of IR procedures per CLBP patient who had ≥1 IR procedures, by sex and fiscal year



CLBP: chronic low back pain; FY: fiscal year; IR: interventional radiology

In these patients, utilization of IR was lowest in the youngest age group. The mean number within each age group was relatively consistent during the observation period (see Figure 5).

FIGURE 5: Mean number of IR procedures per CLBP patient who had ≥1 IR procedures, by age group and fiscal year



CLBP: chronic low back pain; FY: fiscal year; IR: interventional radiology; yrs: years

4.2.3. Diagnostic Imaging

There was an increasing trend in the total number of CLBP-related DI examinations among the CLBP patients from FY 2011/12 to FY 2014/15, though the total number of examinations decreased from FY 2014/15 to FY 2017/18 (see Table 6).

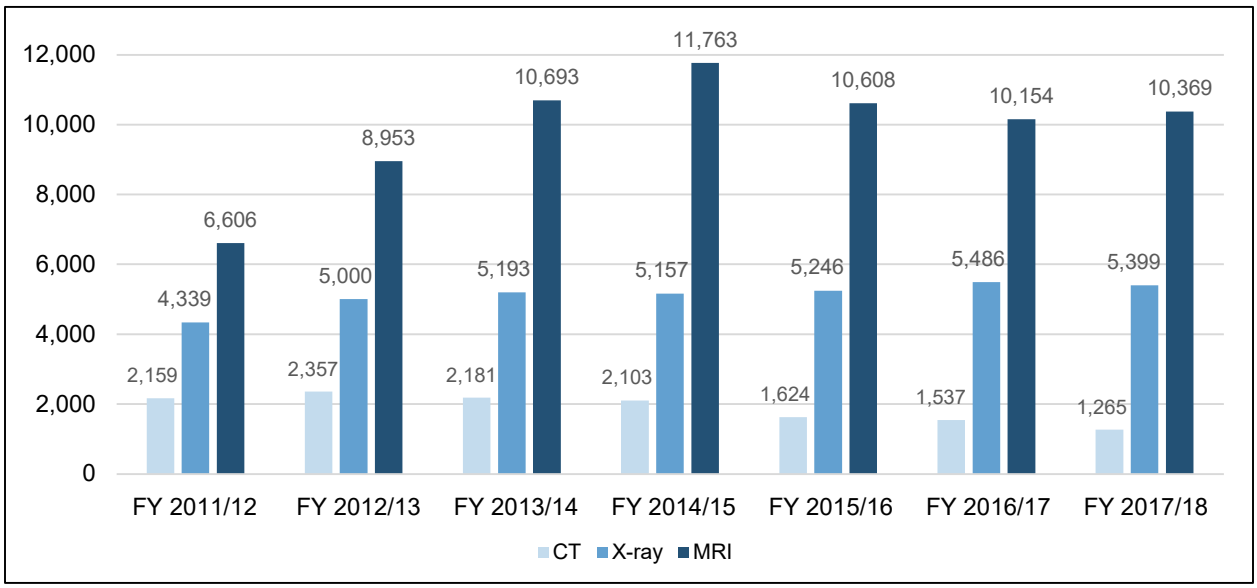
TABLE 6: Total number of CLBP-related DI examinations among CLBP patients, by fiscal year

	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Total DI examinations	13,104	16,310	18,067	19,023	17,478	17,177	17,033

CLBP: chronic low back pain; DI: diagnostic imaging; FY: fiscal year

Of the three categories of DI examinations looked at, the majority of the DI examinations were MRI examinations. During the observation period, the proportion that was MRI examinations increased from 50.4% (6,606 of 13,104 DI examinations) to 60.9% (10,369 of 17,033 DI examinations) (see Figure 6).

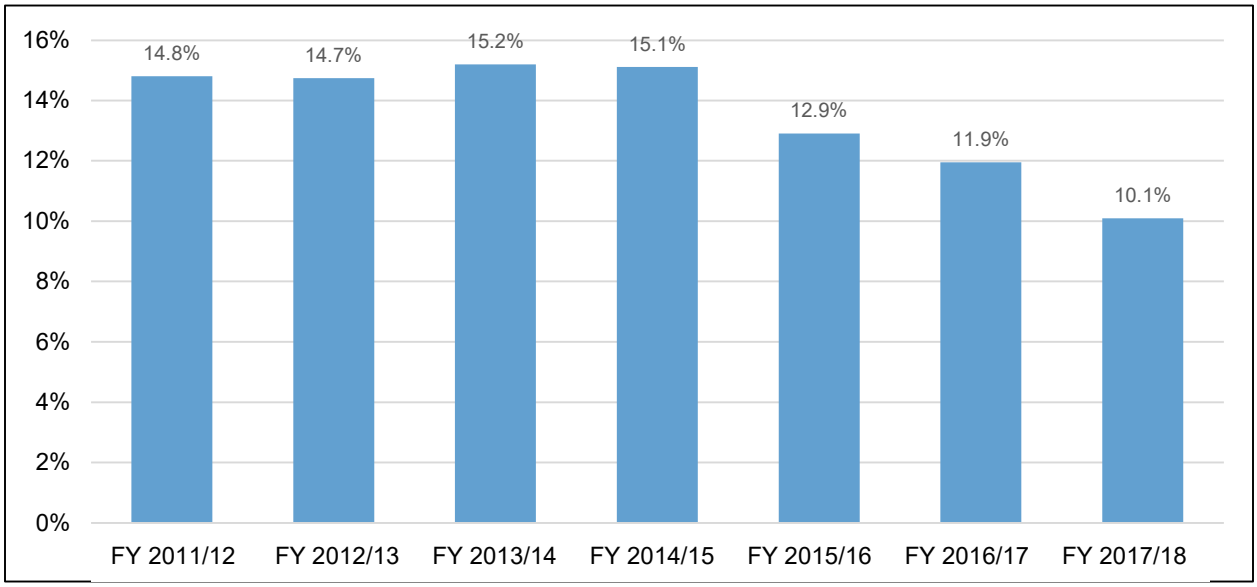
FIGURE 6: Number of CLBP-related DI examinations among CLBP patients, by category and fiscal year



CLBP: chronic low back pain; CT: computed tomography; DI: diagnostic imaging; FY: fiscal year; MRI: magnetic resonance imaging

Not every CLBP patient had a CLBP-related DI examination during the observation period, and the proportion who had one or more DI examinations decreased (see Figure 7).

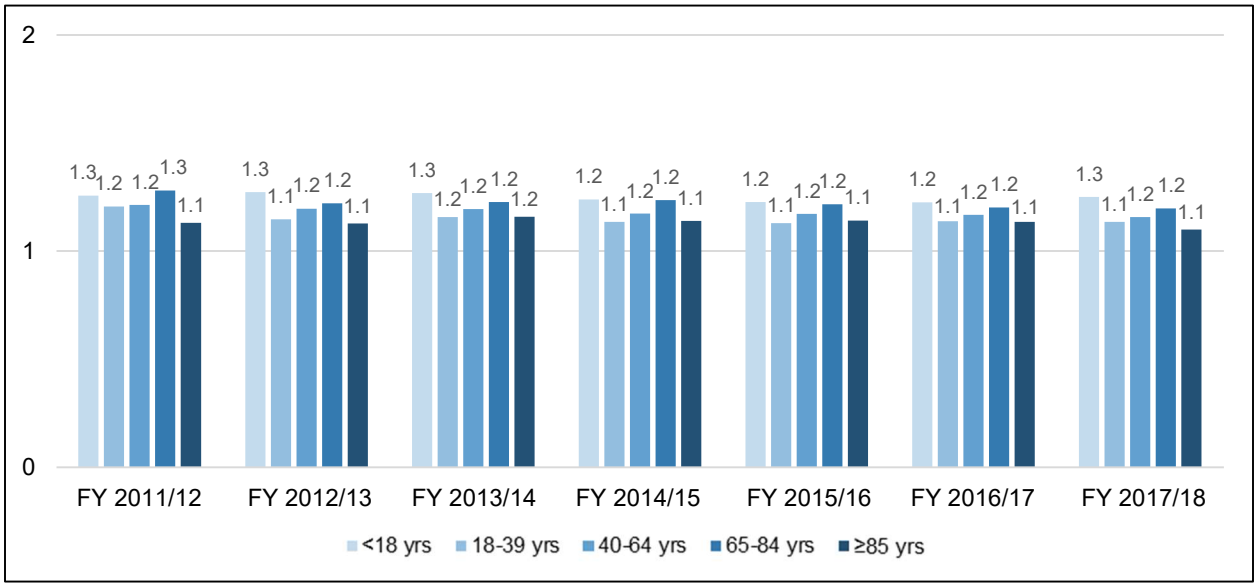
FIGURE 7: Proportion of CLBP patients who had ≥1 CLBP-related DI examinations, by fiscal year



CLBP: chronic low back pain; DI: diagnostic imaging; FY: fiscal year

For CLBP patients who had one or more DI examinations, the mean number of DI examinations per patient remained equal between the sexes during the observation period, at approximately 1.2. However, a minor variation was observed between age groups, with slightly higher utilization of DI examinations in the 0 to 17 years and the 65 to 84 years age groups (see Figure 8).

FIGURE 8: Mean number of CLBP-related DI examinations per CLBP patient who had ≥1 DI examinations, by fiscal year



CLBP: chronic low back pain; DI: diagnostic imaging; FY: fiscal year; yrs: years

4.2.4. Medicine Utilization

Although the total number of medicines dispensed to CLBP patients increased from 2.5 million to 6.4 million during the observation period, the proportion that was CLBP-related decreased from 43.3% to 37.5% (see Table 7).

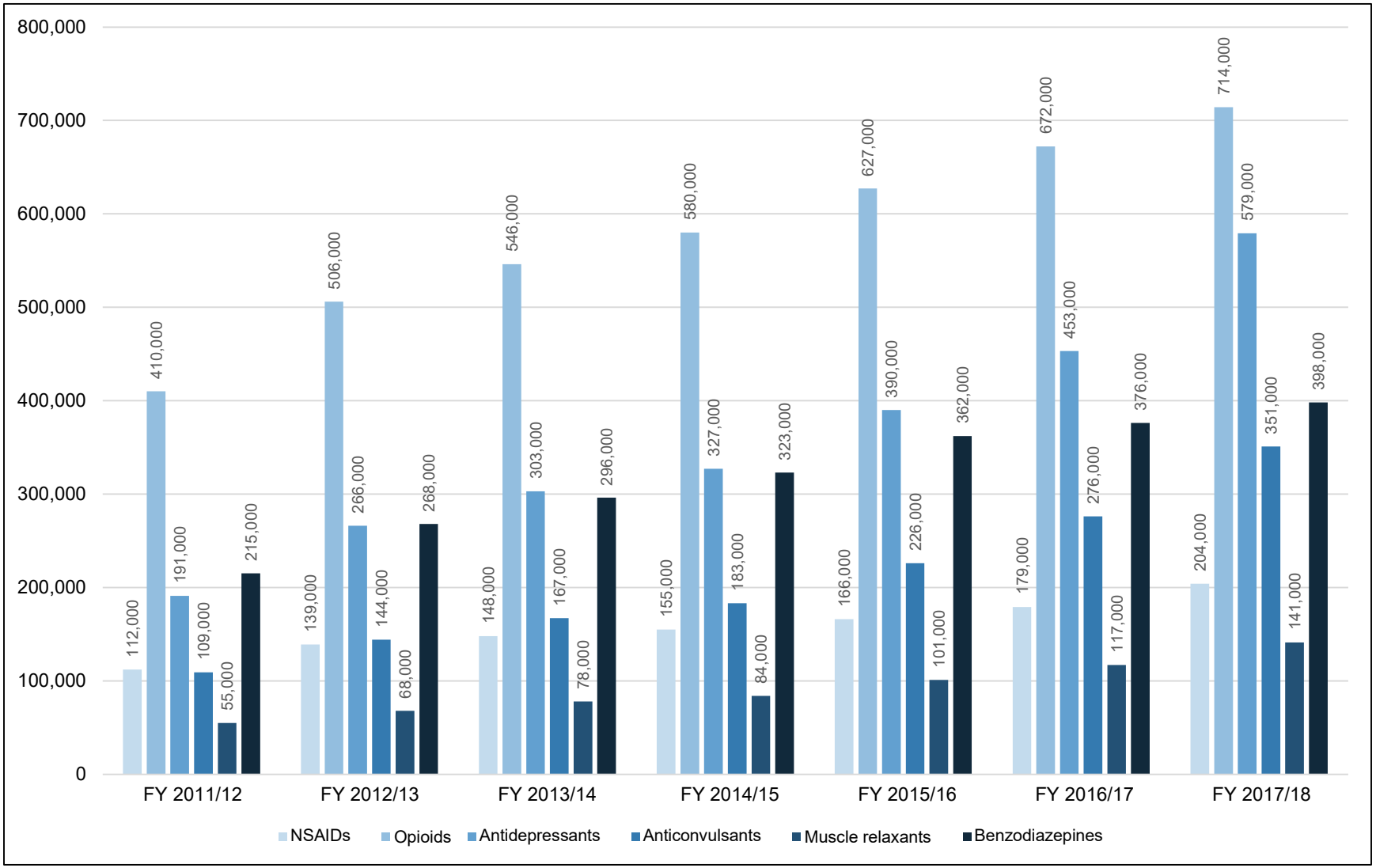
TABLE 7: Total number and distribution of medicines dispensed to CLBP patients, by type and fiscal year

	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Total medicines	2,519,000	3,205,000	3,560,000	3,883,000	4,477,000	5,036,000	6,355,000
Non-CLBP medicines	56.7%	56.7%	56.9%	57.5%	58.3%	58.9%	62.5%
CLBP medicines	43.3%	43.3%	43.1%	42.5%	41.7%	41.1%	37.5%

CLBP: chronic low back pain

Among the CLBP-related medicines dispensed, the total number of medicines dispensed to CLBP patients in each of the six drug classes also increased (see Figure 9). The majority of CLBP-related medicines dispensed were opioids; however, the proportion that was opioids decreased from 37.6% (410,000 of 1,092,000 medicines dispensed) to 29.9% (714,000 of 2,387,000 medicines dispensed).

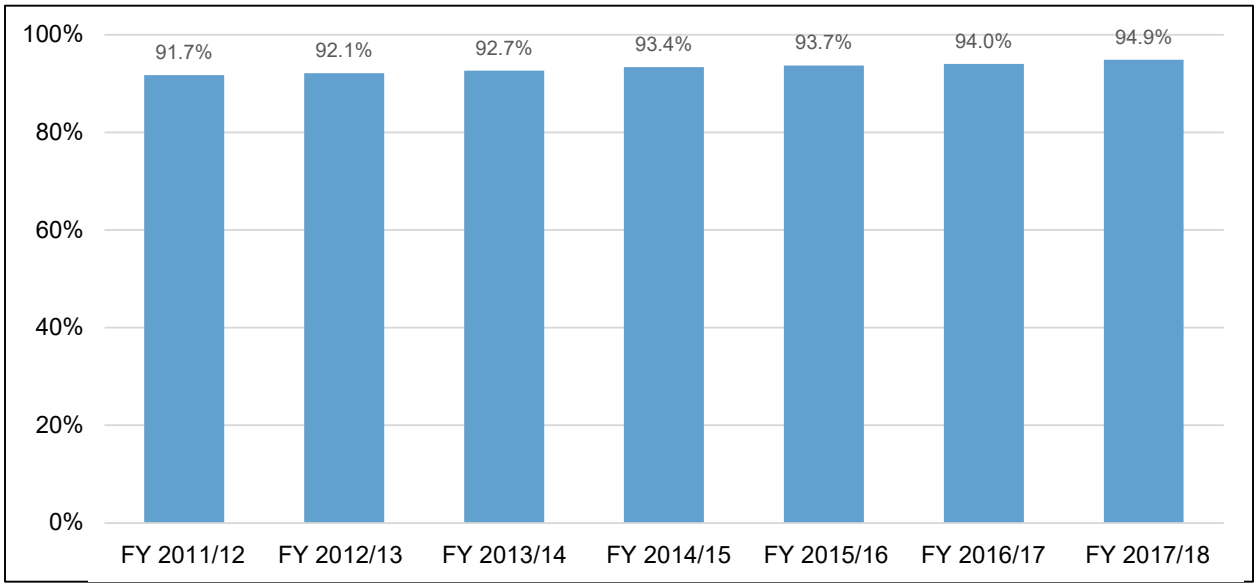
FIGURE 9: Total number of CLBP-related medicines dispensed to CLBP patients, by drug class and fiscal year



CLBP: chronic low back pain; FY: fiscal year; NSAID: nonsteroidal anti-inflammatory drug

Although not every CLBP patient was dispensed CLBP-related medicines during the observation period, the majority were. The proportion of patients who were dispensed one or more CLBP-related medicines increased slightly over the observation period (see Figure 10).

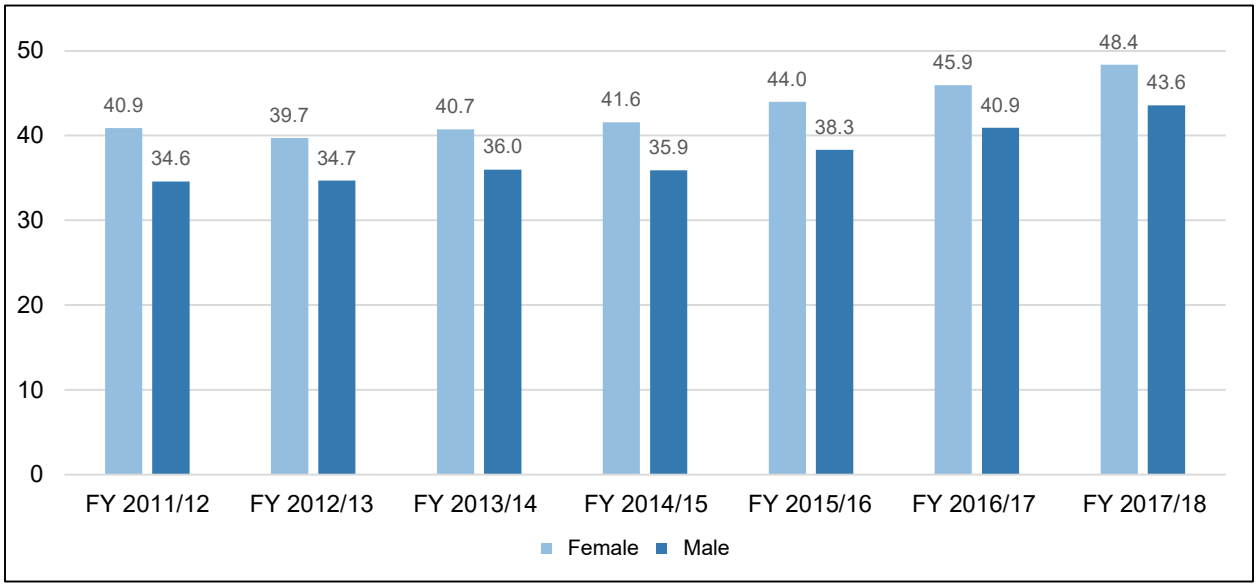
FIGURE 10: Proportion of CLBP patients dispensed ≥1 CLBP-related medicines, by fiscal year



CLBP: chronic low back pain; FY: fiscal year

Among the CLBP patients who were dispensed one or more CLBP-related medicines, the mean number of medicines dispensed per patient was higher for female patients than male patients. There was also a small increasing trend in the mean number of CLBP-related medicines dispensed per CLBP patient over the observation period, increasing from 40.9 and 34.6 to 48.4 and 43.6 per female and male patient, respectively (see Figure 11).

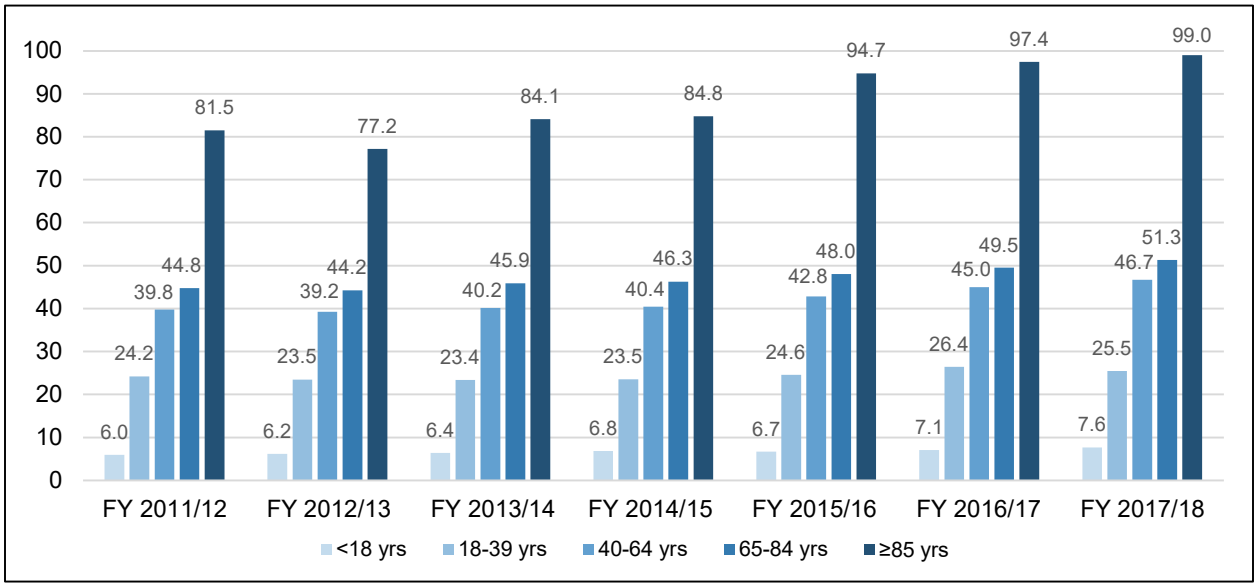
FIGURE 11: Mean number of CLBP-related medicines dispensed per CLBP patient, by sex and fiscal year



CLBP: chronic low back pain; FY: fiscal year

Between the age groups, the mean number of CLBP-related medicines dispensed per patient was relatively stable over the observation period. A positive association between the age groups and the number of medicines dispensed was observed, with less than 8 per patient in the youngest age group and approximately 77 or more in the oldest age group (see Figure 12).

FIGURE 12: Mean number of CLBP-related medicines dispensed per CLBP patient, by age group and fiscal year



CLBP: chronic low back pain; FY: fiscal year; yrs: years

4.2.5. Cost of Medicine

Cost calculations were based on the ABC data, and restricted to medicines dispensed to CLBP patients aged 65 years and older. All costs are expressed in 2019 Canadian dollars.

Among these patients, the total cost of CLBP-related medicines increased from $6.0 million to $8.9 million. There was an increase in costs for all drug classes except NSAIDs (see Table 8).

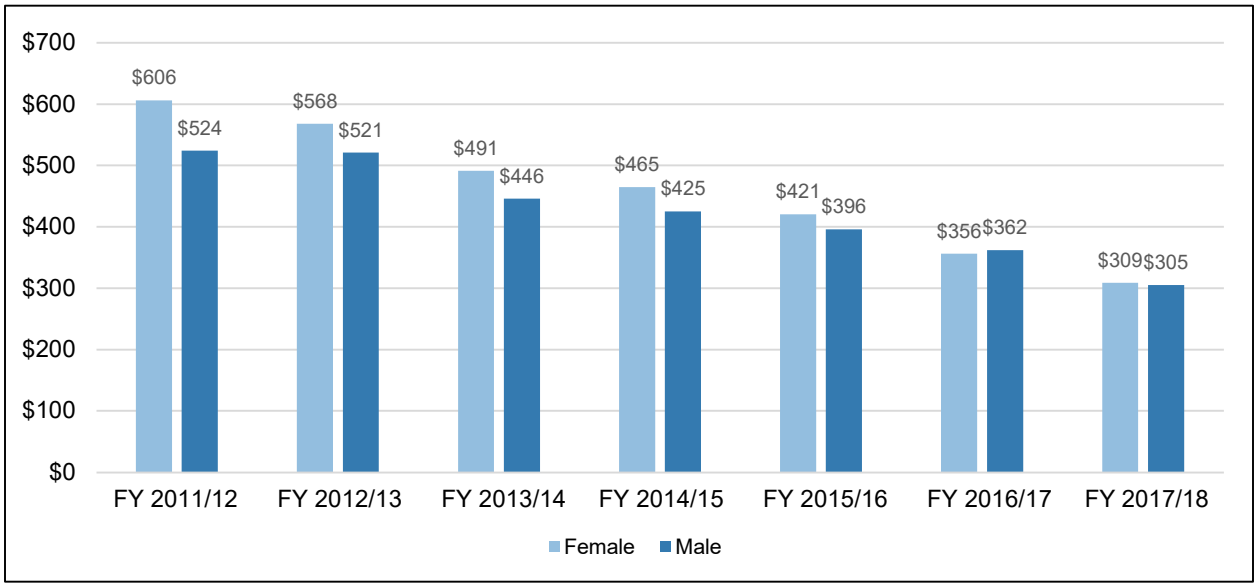
TABLE 8: Total cost of CLBP-related medicines for CLBP patients aged ≥65 years, by drug class and fiscal year

Drug class	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
NSAIDs	$871,000	$1,035,000	$1,004,000	$865,000	$488,000	$458,000	$543,000
Opioids	$2,093,000	$2,530,000	$2,578,000	$2,786,000	$2,996,000	$3,129,000	$3,716,000
Antidepressants	$1,175,000	$1,760,000	$1,732,000	$1,880,000	$2,202,000	$1,694,000	$1,906,000
Anticonvulsants	$1,227,000	$1,256,000	$897,000	$961,000	$863,000	$997,000	$1,423,000
Muscle relaxants	$139,000	$181,000	$200,000	$276,000	$354,000	$458,000	$657,000
Benzodiazepines	$518,000	$651,000	$532,000	$521,000	$536,000	$516,000	$634,000
Total	**$6,023,000**	**$7,413,000**	**$6,943,000**	**$7,289,000**	**$7,439,000**	**$7,252,000**	**$8,879,000**

CLBP: chronic low back pain; FY: fiscal year; NSAID: nonsteroidal anti-inflammatory drug

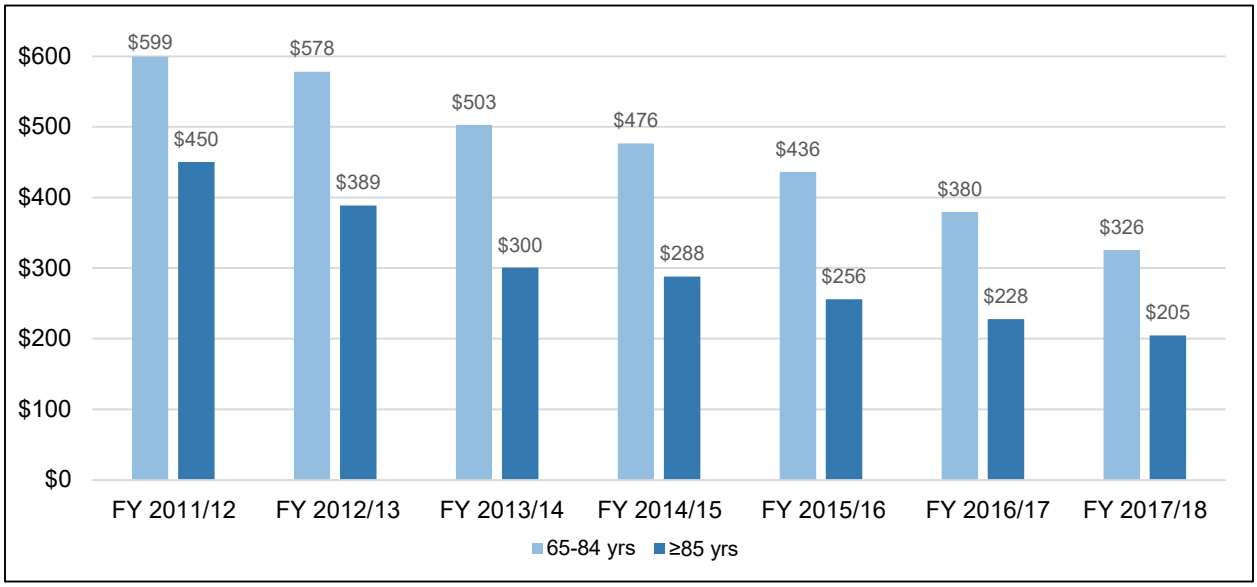
A decreasing trend in the mean cost of CLBP-related medicines per CLBP patient aged 65 years and older emerged over the observation period, for both sexes. The mean cost per patient decreased from $606 and $524 to $309 and $305 for female and male patients, respectively (see Figure 13). The mean cost of CLBP-related medicines per patient for each of the two age groups also decreased, from $599 and $450 to $326 and $205 for the 65 to 84 years and the 85 years and older age groups, respectively (see Figure 14). The decreasing trend was driven by the changes in the mean amount paid per claim in the Coverage for Seniors program (see Table 9).

FIGURE 13: Mean cost of CLBP-related medicines per patient for CLBP patients aged ≥65 years, by sex and fiscal year



CLBP: chronic low back pain; FY: fiscal year

FIGURE 14: Mean cost of CLBP-related medicines per patient for CLBP patients aged ≥65 years, by age group and fiscal year



CLBP: chronic low back pain; FY: fiscal year; yrs: years

TABLE 9: Mean amount paid per claim in the Coverage for Seniors program, by drug class and fiscal year

Drug class	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
NSAIDs	$62.36	$61.68	$60.06	$48.59	$25.65	$23.30	$20.55
Opioids	$62.24	$60.71	$55.70	$54.10	$50.97	$47.66	$41.11
Antidepressants	$41.20	$43.12	$36.54	$33.92	$34.53	$22.46	$16.33
Anticonvulsants	$84.91	$62.61	$37.26	$36.50	$26.11	$24.44	$22.13
Muscle relaxants	$42.95	$40.99	$39.01	$46.34	$54.22	$56.91	$54.31
Benzodiazepines	$17.01	$16.51	$12.10	$10.83	$9.96	$8.56	$8.04

FY: fiscal year; NSAID: nonsteroidal anti-inflammatory drug

4.3. Care Quality Variables

4.3.1. Polypharmacy

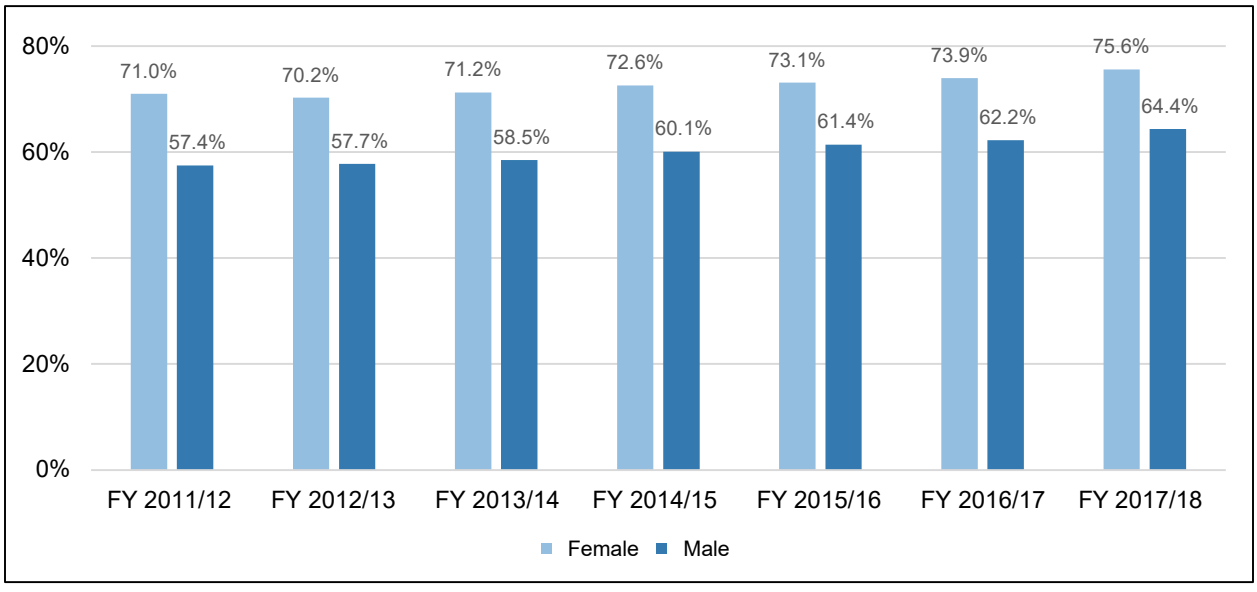
Polypharmacy or over-prescription was potentially seen in many of the CLBP patients over the observation period. Table 10 describes the number of CLBP patients dispensed (a) five or more and (b) nine or more (CLBP- or non-CLBP-related) medicines in each FY during the observation period. More female CLBP patients were consistently dispensed five/nine or more medicines than male patients. Over 70% of female patients versus approximately 60% of male patients had five or more medicines dispensed, whereas over 44% of female patients versus approximately 33% of male patients were dispensed nine or more medicines. Both the proportion of female and male patients who were dispensed five/nine or more medicines increased over the observation period (see Figures 15 and 16).

TABLE 10: Number of CLBP patients with ≥5 and ≥9 medicines dispensed, by fiscal year

	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Total patients	72,094	92,857	99,540	106,624	115,324	122,687	145,013
Patients dispensed ≥5 medicines	46,696	59,939	65,084	71,221	78,059	84,051	102,137
Patients dispensed ≥9 medicines	27,753	35,342	38,131	42,402	46,887	50,883	63,602

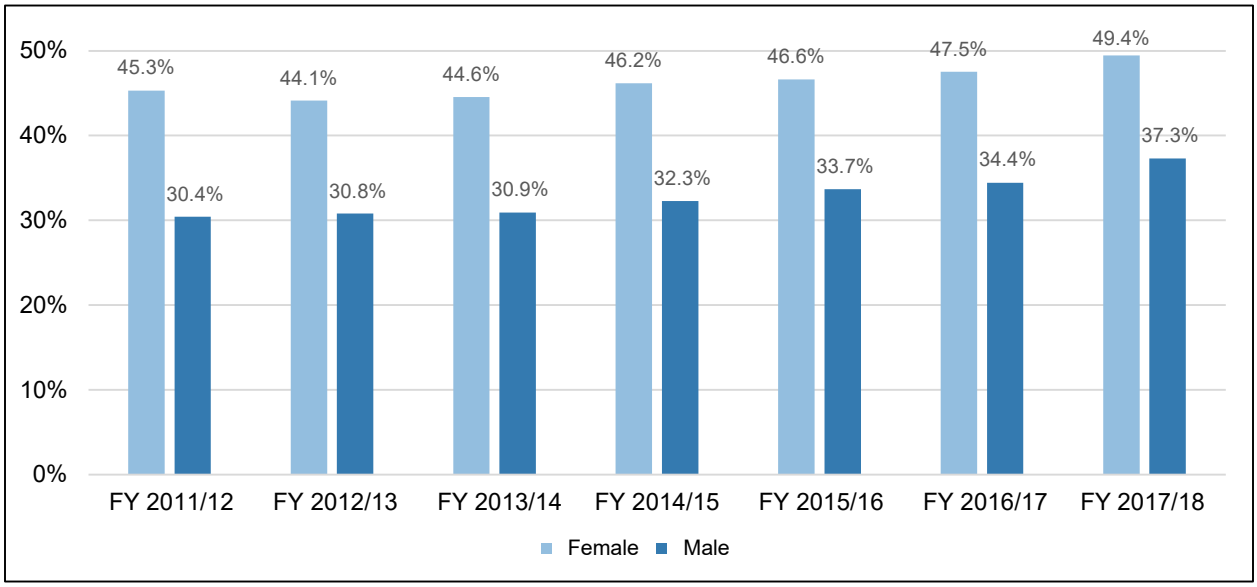
CLBP: chronic low back pain; FY: fiscal year

FIGURE 15: Proportion of CLBP patients ≥5 dispensed medicines, by sex and fiscal year



CLBP: chronic low back pain; FY: fiscal year

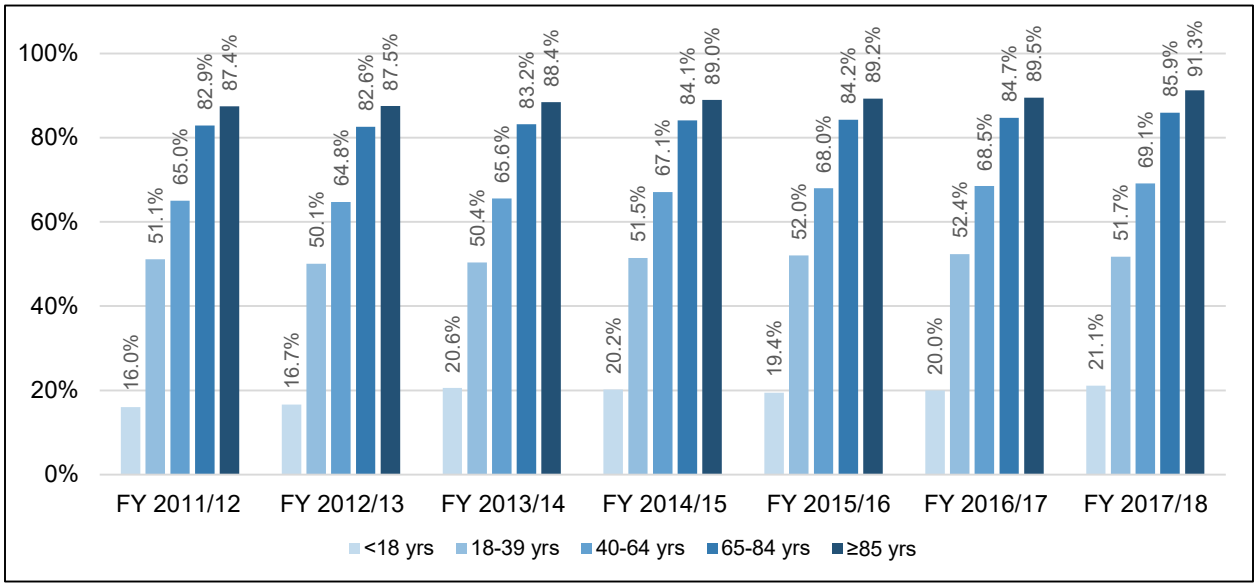
FIGURE 16: Proportion of CLBP patients with ≥9 dispensed medicines, by sex and fiscal year



CLBP: chronic low back pain; FY: fiscal year

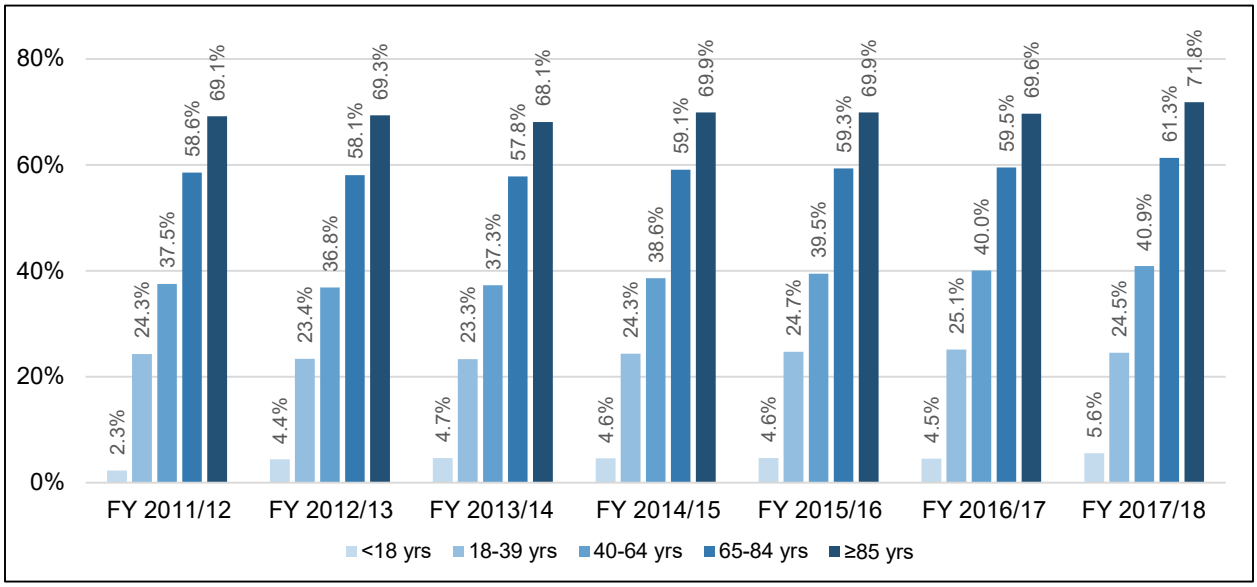
Between the age groups, the youngest age group had the lowest proportion of CLBP patients dispensed five/nine or more medicines and the oldest age group had the highest proportion. Approximately 20% of the youngest age group versus over 87% of the oldest age group were dispensed five or more medicines, while less than 5% of the youngest age group versus approximately 70% of the oldest age group were dispensed nine or more medicines. There was a positive relationship between age and the proportion of patients dispensed five/nine or more medicines (see Figures 17 and 18).

FIGURE 17: Proportion of CLBP patients ≥5 dispensed medicines, by age group and fiscal year



CLBP: chronic low back pain; FY: fiscal year; yrs: years

FIGURE 18: Proportion of CLBP patients ≥9 dispensed medicines, by age group and fiscal year

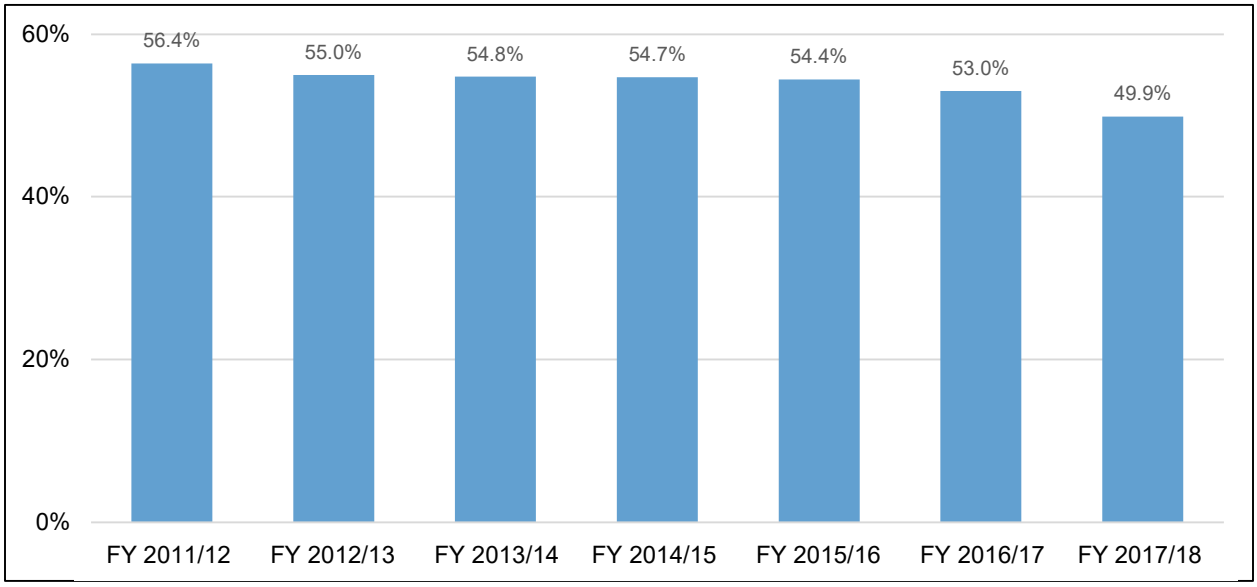


CLBP: chronic low back pain; FY: fiscal year; yrs: years

4.3.2. Doctor Shopping

Around half the CLBP patients were dispensed opioids during the observation period, with a small decreasing trend seen over the period (see Figure 19).

FIGURE 19: Proportion of CLBP patients with dispensed opioids, by fiscal year



CLBP: chronic low back pain; FY: fiscal year

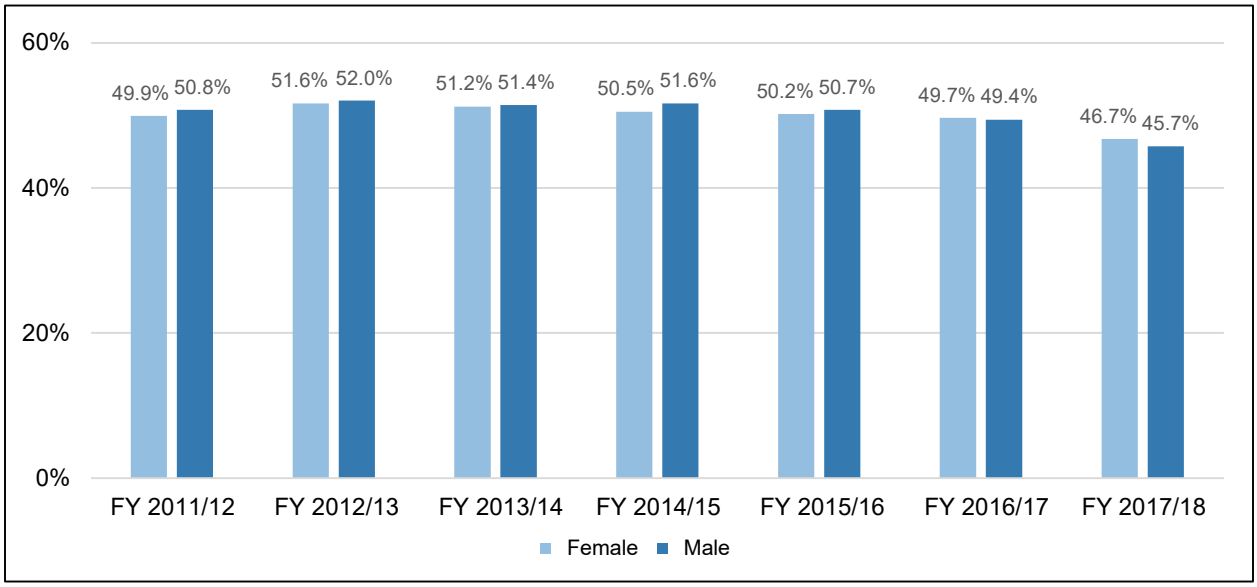
With regards to potential doctor shopping for this particular drug class, Table 11 describes the number of CLBP patients with (a) two or more and (b) four or more opioid prescribers over the observation period. Among the patients with dispensed opioids, approximately 50% had two or more opioid prescribers and less than 20% had four or more opioid prescribers, with a decreasing trend observed over most of the observation period for both female and male patients in both categories (see Figures 20 and 21).

TABLE 11: Number of CLBP patients with dispensed opioids from ≥2 and ≥4 prescribers, by fiscal year

	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Total patients	72,094	92,857	99,540	106,624	115,324	122,687	145,013
Patients with ≥2 prescribers	20,462	26,458	27,977	29,779	31,658	32,210	33,470
Patients with ≥4 prescribers	6,600	8,767	9,423	9,853	9,992	9,471	8,311

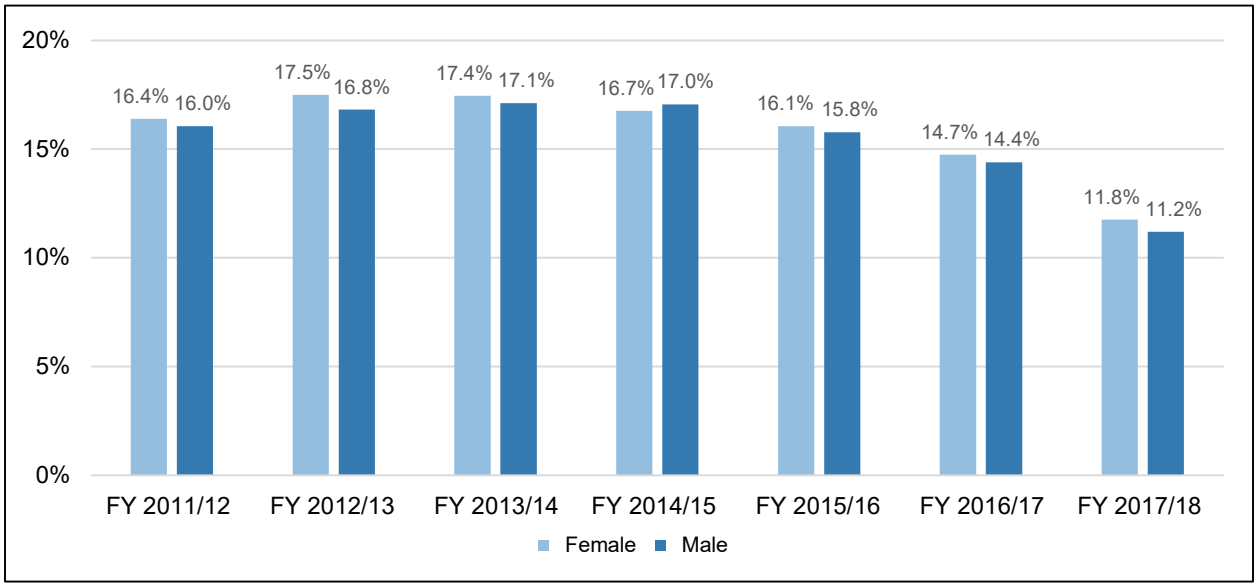
CLBP: chronic low back pain; FY: fiscal year

FIGURE 20: Proportion of CLBP patients with dispensed opioids from ≥2 opioid prescribers, by sex and fiscal year



CLBP: chronic low back pain; FY: fiscal year

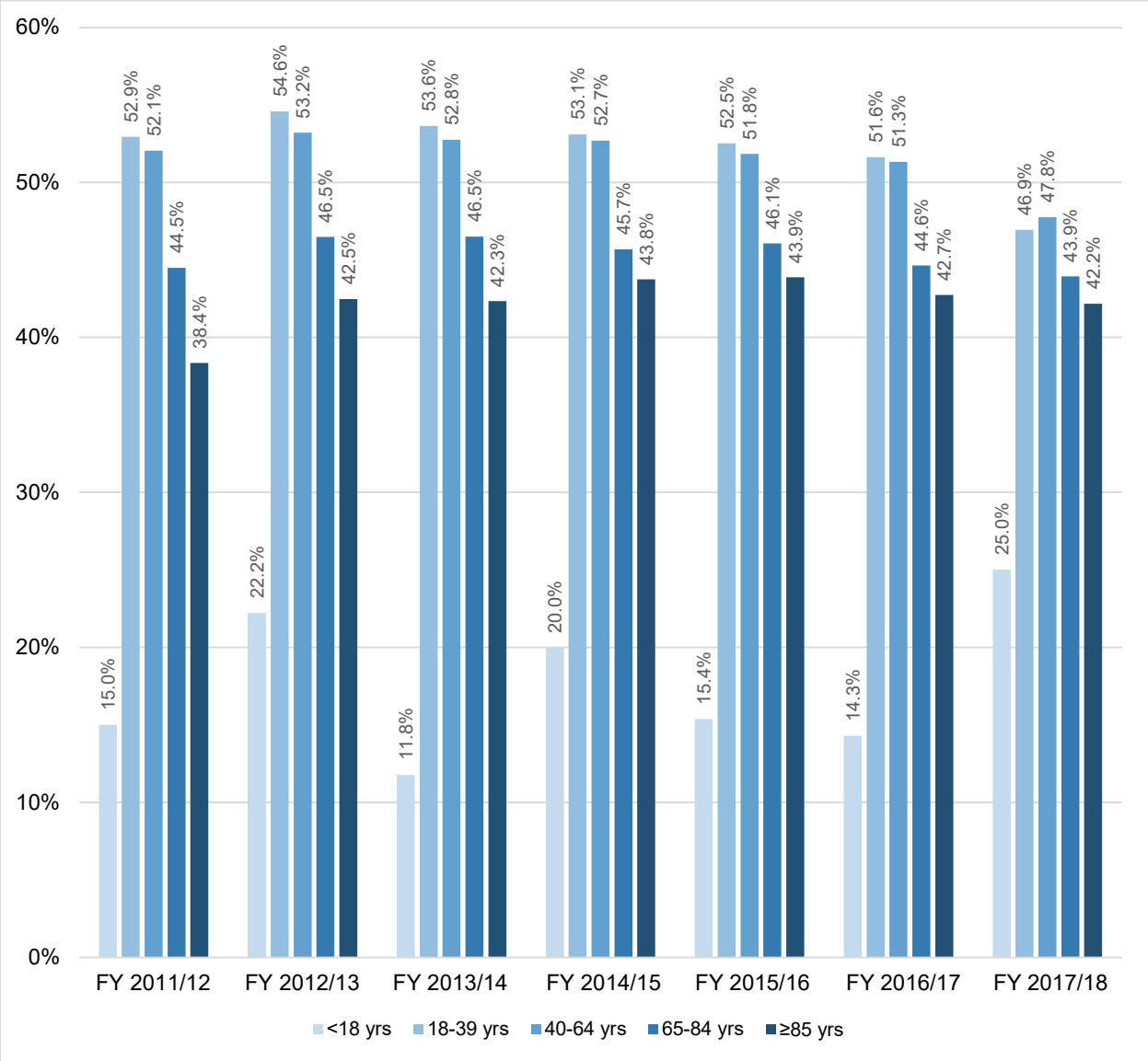
FIGURE 21: Proportion of CLBP patients with dispensed opioids from ≥4 opioid prescribers, by sex and fiscal year



CLBP: chronic low back pain; FY: fiscal year

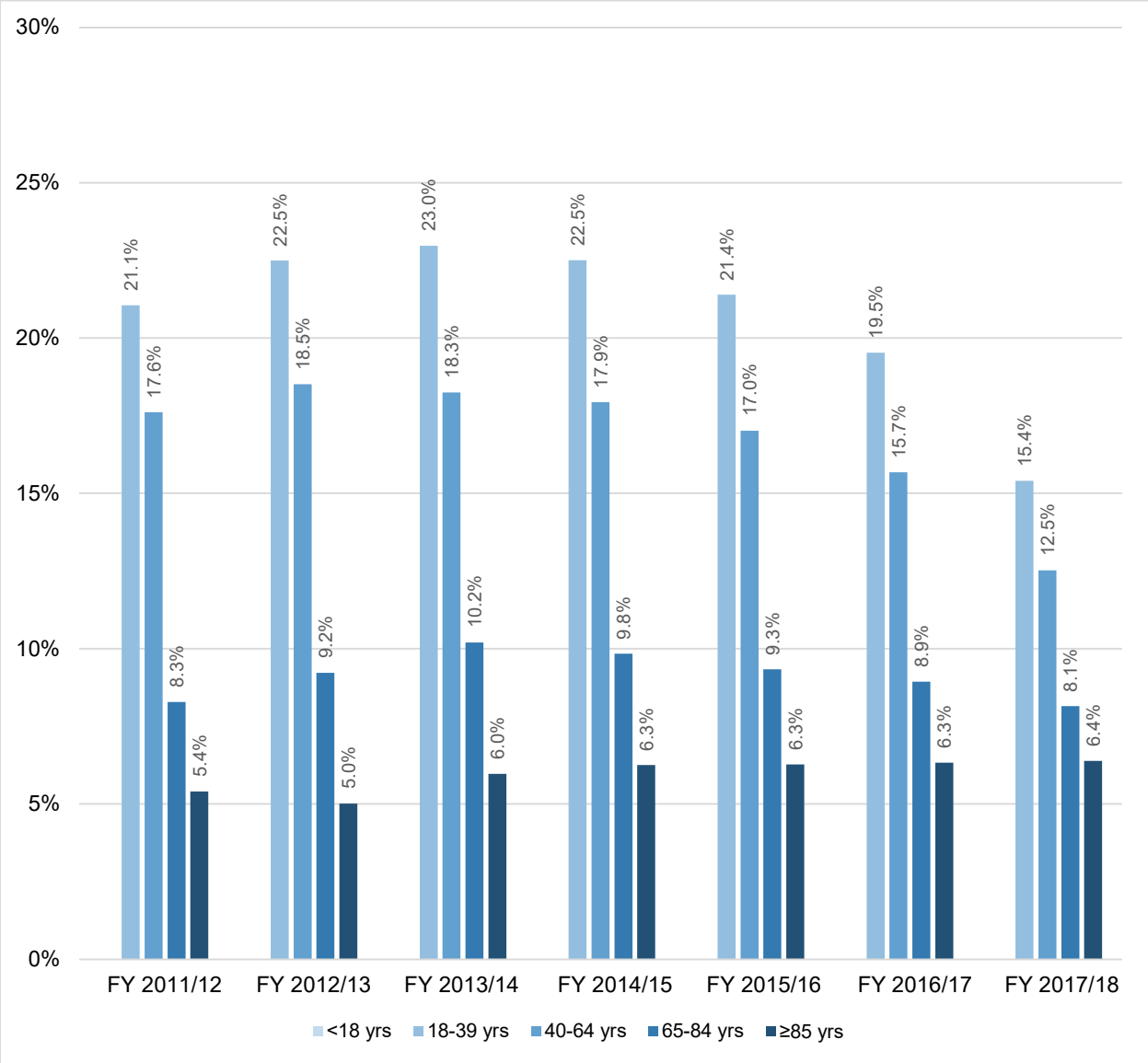
The proportion of CLBP patients with dispensed opioids who had two/four or more prescribers was highest in the 18 to 39 years and 40 to 64 years age groups. There was a decreasing trend observed over most of the observation period for both age groups in both categories (see Figures 22 and 23).

FIGURE 22: Proportion of CLBP patients with dispensed opioids from ≥2 opioid prescribers, by age group and fiscal year



CLBP: chronic low back pain; FY: fiscal year; yrs: years

FIGURE 23: Proportion of CLBP patients with dispensed opioids from ≥4 opioid prescribers, by age group and fiscal year



Note: The proportion for the <18 yrs age group was 0% for all FYs in the observation period.
CLBP: chronic low back pain; FY: fiscal year; yrs: years

4.3.3. Opioid-Related Poisoning

The number of CLBP patients who had an opioid-related poisoning diagnosis increased over the observation period. However, the proportion of CLBP patients with dispensed opioids who had an opioid poisoning diagnosis remained under 0.1% (see Table 12).

TABLE 12: Number of CLBP patients who had ≥1 opioid-poisoning diagnoses, by fiscal year

	FY 2011/12	FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18
Proportion of patients with dispensed opioids	56.4%	55.0%	54.8%	54.7%	54.4%	53.0%	49.9%
Number of patients who had ≥1 opioid-related poisoning diagnoses	16	25	12	16	35	36	56
Proportion of patients with dispensed opioids who had ≥1 opioid-related poisoning diagnoses	0.04%	0.05%	0.02%	0.03%	0.06%	0.06%	0.08%

CLBP: chronic low back pain; FY: fiscal year

4.3.4. Opioid-Related Mortality

A relatively small number of CLBP patients died of prescription opioid-related causes during the observation period. Over the time period examined (FY 2012/12 through FY 2017/18) 13 patients died. Year by year, the proportion of patients who died ranged between 0.0% and 0.014%.

5. Conclusion

Results from the analysis of Alberta's health data indicate that the prevalence of CLBP increased from 1.8% in FY 2011/12 to 3.0% in FY 2017/18, and that the number of CLBP patients increased from 72,094 to 145,013 during this period. More female patients were affected by CLBP than male patients. The majority of CLBP patients were in the 40 and 64 years age group (over 50%), followed by the 18 to 39 years age group.

There was a substantial increase in the total healthcare service and medicine utilization by CLBP patients during the observation period. The total number of practitioner claims among the CLBP patients increased from 1.9 million to 4.5 million, though the proportion that was CLBP-related fell from 18.5% to 15.3%. The total number of CLBP-related IR procedures increased from 9,430 to 27,223, and the proportion of CLBP patients who had one or more IR procedures increased from 6.7% to 8.6%. The total number of CLBP-related DI examinations increased from 13,104 to 17,033. The total number of medicines dispensed increased from 2.5 million to 6.4 million; though the proportion that was CLBP-related fell from 43.3% to 37.5%. In CLBP patients aged 65 years or older, the total cost of CLBP-related medicines increased from $6.0 million to $8.9 million.

At the individual level, the mean number of practitioner claims, IR procedures, and DI examinations per CLBP patient did not change substantially during the observation period. Each CLBP patient had approximately 4.6 practitioner claims per fiscal year, with the mean number being slightly higher for female patients. For those who had IR procedures, each patient had approximately 2.0 procedures per fiscal year, with the mean number being slightly higher for female patients. For those who had one or more DI examinations, each patient had approximately 1.2 examinations per fiscal year. The mean number of CLBP-related medicines dispensed per CLBP patient, on the other hand, increased during the observation period, from 40.9 and 34.6 to 48.4 and 43.6 medicines for female and male patients, respectively. The mean cost of CLBP-related medicines per patient, however, fell in this period, from $606 and $524 to $309 and $305 for female and male patients, respectively.

The four indicators of inappropriate use of medicine in CLBP management showed different trends. Regarding potential polypharmacy, the proportion of CLBP patients with five/nine or more medicines increased during the observation period. For five or more medicines, the proportion increased from 71.0% and 57.4% to 75.6% and 64.4% for female and male patients, respectively; for five/nine or more medicines, the proportion increased from 45.3% and 30.4% to 49.4% and 37.3% for female and male patients, respectively. Regarding doctor shopping for opioids, among CLBP patients with dispensed opioids, the proportion with two/four or more opioid prescribers decreased overall during the observation period. For two or more prescribers, the proportion decreased from 49.9% and 50.8% to 46.7% and 45.7% for female and male patients, respectively; for four or more prescribers, the proportion decreased from 16.4% and 16.0% to 11.8% and 11.2% of female and male patients, respectively. The proportion of CLBP patients with dispensed opioids who had an opioid-related poisoning diagnosis varied only slightly during the observation period, and remained under 0.1%. Very few CLBP patients died from opioid-related.

Appendix A: International Classification of Disease Codes for Chronic Low Back Pain

TABLE A.1: List of ICD-9 codes in the CLBP case definition

Description	ICD-9 code
Ankylosing spondylitis and other inflammatory spondylopathies	720
Spondylosis and allied disorders	721
Intervertebral disc disorders	722
Other and unspecified disorders of back	724
Sprains and strains of sacroiliac region	846
Sprains and strains of other and unspecified parts of back	847

CLBP: chronic low back pain; ICD-9: International Classification of Disease, 9th revision

Appendix B: Interventional Radiology Procedures for Chronic Low Back Pain

TABLE B.1: List of IR procedures and associated health service codes for CLBP

IR procedure	Health service code
Joint injection (aspiration)	16.69D
Vertebroplasty/kyphoplasty	93.05D
Nerve blocks	18.29E
Epidural steroid injection	16.99A
Radiofrequency ablation	18.29F

Source: Personal communication, Dr. Derek Emery, 30 Jan 2019

CLBP: chronic low back pain; IR: interventional radiology

Appendix C: Diagnostic Imaging Examinations for Chronic Low Back Pain

TABLE C.1: List of DI modalities and associated CPEL codes for CLBP

DI modality	CPEL code
Computed tomography (CT)	
CT lumbar spine, nonenhanced	300500
CT lumbar spine, enhanced	300510
CT lumbar spine, combined, nonenhanced & enhanced	300520
CT lumbar spine, (with subarachnoid contrast	300530
General radiography/x-ray	
Spine, lumbar, 1–3 projections	470230
Spine, lumbar, 4 or more projections	470240
Tomography, spine, linear, 1 projection	490120
Tomography, spine, linear, 2 projections	490130
Magnetic resonance (MR) imaging	
MR L-spine without contrast	510160
MR L-spine with & without contrast	510170

Source: Personal communication, Dr. Derek Emery, 19 Mar 2019

CLBP: chronic low back pain; CPEL: Common Procedure and Examination List; DI: diagnostic imaging

Appendix D: List of Medicines for Chronic Low Back Pain

TABLE D.1: Drug classes and associated ATC codes for CLBP

Drug class	ATC code(s)
NSAIDs	
Non-selective	M01A (excl. M01AH)
Coxibs	M01AH
Opioids	
Natural opium alkaloids	N02AA
Phenylpiperidine derivatives	N02AB
Diphenylpropylamine derivatives	N02AC
Benzomorphan derivatives	N02AD
Opioids in combination with antispasmodics	N02AG
Opioids in combination with non-opioid analgesics	N02AJ
Other opioids	N02AX
Antidepressants	
Non-selective monoamine reuptake inhibitors/tricyclics	N06AA
Selective serotonin reuptake inhibitors	N06AB
Monoamine oxidase inhibitors	N06AF, N06AG
Other antidepressants	N06AX
Anticonvulsants*	
Barbiturates and derivatives	N03AA
Hydantoin derivatives	N03AB
Oxazolidine derivatives	N03AC
Succinimide derivatives	N03AD
Carboxamide derivatives	N03AF
Fatty acid derivatives	N03AG
Other antiepileptics	N03AX
Muscle relaxants	
Peripherally acting agents	M03A
Centrally acting agents	M03B
Directly acting agents	M03C
Benzodiazepines	
Benzos	N03AE, N05BA, N05CD
Z-drugs	N05CF

* Does not include benzodiazepine derivatives

ATC: Anatomical Therapeutic Chemical

Appendix E: Opioid-Related Poisoning International Classification of Disease Codes

TABLE E.1: ICD-10 codes indicative of opioid-related poisoning

Description	ICD-10 code
Poisoning by opium	T400
Poisoning by other opioids	T402
Poisoning by methadone	T403
Poisoning by other synthetic narcotics	T404
Poisoning by other and unspecified narcotics	T406

ICD-10: International Classification of Disease, 10th revision

Appendix F: Identification of Prescription Opioid-Related Deaths

TABLE F.1: Identification of prescription opioid-related deaths and associated ICD-10 codes

Criterion	ICD-10 codes	Description
1. Underlying cause of death	X40–X49, X60–X69, X85–X90, Y10–Y19	Poisoning
and		
2. Multiple cause of death	T402, T403, T404, T406	Prescription opioid poisoning and/or other unspecified narcotics

ICD-10: International Classification of Disease, 10th revision

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Author Contributions

Thomas Lo contributed to study conception and design, data collection and analysis, interpretation, and revisions of the report.

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