Methodology Notes

November 2022

Overuse of Tests and Treatments in Canada

Choosing Wisely Canada™

Canadian Institute for Health Information

Institut canadien d'information sur la santé

Production of this document is made possible by financial contributions from Health Canada and provincial and territorial governments. The views expressed herein do not necessarily represent the views of Health Canada or any provincial or territorial government.

Canadian Institute for Health Information
495 Richmond Road, Suite 600
Ottawa, Ontario K2A 4H6

Phone: 613-241-7860
Fax: 613-241-8120
www.cihi.ca
copyright@cihi.ca

ISBN 978-1-77479-150-9 (PDF)

How to cite this document:
Canadian Institute for Health Information. *Overuse of Tests and Treatments in Canada — Methodology Notes*. Ottawa, ON: CIHI; 2022.

Cette publication est aussi disponible en français sous le titre *Surutilisation des examens et des traitements au Canada — notes méthodologiques*.

ISBN 978-1-77479-151-6 (PDF)

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Canadian Institute for Health Information and Choosing Wisely Canada

Canadian Institute for Health Information

The Canadian Institute for Health Information (CIHI) is an independent, not-for-profit organization that supplies essential information on Canada's health systems and the health of Canadians. CIHI provides comparable and actionable data and information that are used to accelerate improvements in health care, health system performance and population health across Canada. Stakeholders use CIHI's broad range of health system databases, measurements and standards, together with CIHI's evidence-based reports and analyses, in their decision-making processes. CIHI protects the privacy of Canadians by ensuring the confidentiality and integrity of the health care information it provides. Visit CIHI's website for more information.

Choosing Wisely Canada

Choosing Wisely Canada (CWC) is the national voice for reducing unnecessary tests and treatments in Canada. As part of this campaign, Canadian national societies representing a broad spectrum of clinicians have developed a number of recommendation lists. These lists describe commonly used tests and treatments that are not supported by scientific evidence and may expose patients to harm. These recommendations aim to mobilize health care providers and organizations to adopt the recommendations and make them part of routine practice. There are currently more than 400 Canadian recommendations, as well as a website, patient pamphlets and de-implementation toolkits to support clinicians and their patients. Visit CWC's website for more information.

Recommendations for analysis

The overuse of tests and treatments that offer little to no benefit to patients — and may even cause harm — represents low-value health care. *Overuse of Tests and Treatments in Canada — Progress Report* is a follow-up to the first joint report between CIHI and CWC, *Unnecessary Care in Canada*,[1] which was released in 2017 and measured the extent of overuse of 8 common tests and treatments. The progress report measures the overuse of 12 tests and treatments related to CWC recommendations developed by national clinician societies. These measures span community care, emergency care and hospital care settings, and include an assessment of progress on 5 measures that were previously reported in 2017. Among the 7 newly added measures, several are based on CIHI indicators.

Measures on tests and treatments related to CWC recommendations were selected for the progress report based on the following parameters.

- **Data availability and suitability:** The data required to measure key aspects of the recommendation was available in-house at CIHI and allowed for analysis that met the report's objectives, including the measurement of the trend over time, jurisdictional variation and factors associated with overuse of tests and treatments.
- **Materiality and scope of overuse:** The low-value test or treatment identified in the recommendation was commonly overused, affected many patients and/or was costly.
- **Value to stakeholders:** The recommendation was seen as a priority by CWC or across multiple jurisdictions or organizations, or was identified by multiple professional societies and medical specialties.
- **Breadth and/or diversity:** The recommendations collectively included a mix of new and repeat analyses from the 2017 report, and a diversity of health care settings and patient populations.
- **Alignment:** The measures were synergistic with priority themes identified in *CIHI's Strategic Plan, 2022 to 2027.*

Based on these criteria, 12 tests and treatments related to CWC recommendations were identified and measured in this report. For certain recommendations, the analyses in the report do not precisely reflect all aspects of the recommendation due to limitations of administrative data and/or to align with existing CIHI indicators and measures in Canada.

Data sources

CIHI data sources

Discharge Abstract Database–Hospital Morbidity Database

The Discharge Abstract Database (DAD) captures administrative, clinical and demographic information on hospital discharges from facilities in all provinces and territories outside Quebec. Data from Quebec is submitted to CIHI directly by the ministère de la Santé et des Services sociaux du Québec. This data is appended to the DAD to create the Hospital Morbidity Database (HMDB). The Discharge Abstract Database–Hospital Morbidity Database (DAD-HMDB) uses the *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada* (ICD-10-CA) to code diagnoses and the *Canadian Classification of Health Interventions* (CCI) to code interventions.

National Ambulatory Care Reporting System

The National Ambulatory Care Reporting System (NACRS) captures information on client visits to hospitals and community-based ambulatory care settings. NACRS currently collects data on day surgeries, emergency department use and other ambulatory care visits. Data varies by province and territory, with some jurisdictions reporting complete data coverage, including full diagnosis information (Ontario, Alberta and Yukon), and other jurisdictions submitting lower levels of detail, submitting partial data coverage or not submitting data. NACRS uses the ICD-10-CA and CCI classifications to code diagnoses and interventions.

Continuing Care Reporting System

The Continuing Care Reporting System (CCRS) includes demographic, clinical, functional and resource utilization information on individuals receiving care in publicly funded residential care facilities (e.g., long-term care homes) or receiving continuing care services in hospitals. Data varies by province and territory, with some jurisdictions reporting complete data and other jurisdictions submitting partial or no data. Nursing staff and other health providers conduct assessments of individuals, with the data primarily being collected using the Resident Assessment Instrument–Minimum Data Set 2.0 (RAI-MDS 2.0) ©.

Integrated interRAI Reporting System

Certain jurisdictions have transitioned or started transitioning to the interRAI Long-Term Care Facilities (interRAI LTCF) © assessment tool, the new instrument for resident assessments in long-term care. Data collected using this assessment tool is submitted to CIHI's Integrated interRAI Reporting System (IRRS). Data varies by province and territory, with some jurisdictions reporting complete data (New Brunswick) and other jurisdictions submitting partial data (Saskatchewan) or not submitting data. Data includes demographic, clinical, functional and resource utilization information on individuals receiving care in publicly funded long-term care homes, with assessments conducted by nursing staff and other health providers.

National Physician Database, Patient-Level Physician Billing

Patient-Level Physician Billing (PLPB) data is used to populate the National Physician Database (NPDB), which contains physicians' billing claims (fee codes) for publicly insured medical services that provincial and territorial medical care programs submit to CIHI. The NPDB provides information on demographic characteristics of physicians, physician payments and physicians' level of activity within Canada's health care systems. For each physician visit, the PLPB Repository has additional visit information at the patient level, including the reason for the visit (*International Classification of Diseases, Ninth Revision* [ICD-9] codes), the service billed for and the location of the service provided. Patient-level data varies by province and territory, with some jurisdictions reporting complete data and others not submitting data.

National Prescription Drug Utilization Information System

The National Prescription Drug Utilization Information System (NPDUIS) contains drug claims–level data collected from publicly financed drug benefit programs. Data on public drug programs varies by province and territory, with data submissions from all provinces and Yukon. Claims financed from private sources are reported for selected provinces. NPDUIS houses pan-Canadian information related to public program formularies, drug claims, public drug plan policies and drug product information.

Other data sources

Canadian Community Health Survey

Statistics Canada's **Canadian Community Health Survey (CCHS)** provides health data for health regions and jurisdictions across Canada. The survey includes information on a wide range of topics, including diseases and health conditions, health care services, lifestyle and social conditions, and mental health and well-being. It also provides information on the socio-demographic, income and labour force characteristics of the population. Data is based on interviews with approximately 65,000 respondents per year. Respondents are age 12 or older and reside in households across all provinces and territories. See Statistics Canada's Canadian Community Health Survey — Annual Component (CCHS) for sampling, weighting and other survey details.

Table 1 Overview of CIHI data coverage, by service (as of June 30, 2022)

Provinces and Territories	Services					
	Acute care	Day surgery	Emergency care*	Long-term care†	Medication claims data	Patient-level physician billing
N.L.	DAD	DAD	—	CCRS	NPDUIS	—
P.E.I.	DAD	NACRS	—	—	NPDUIS	—
N.S.	DAD	NACRS	—	CCRS	NPDUIS	NPDB
N.B.	DAD	DAD	—	IRRS	NPDUIS	—
Que.	HMDB	HMDB	—	—	‡	—
Ont.	DAD	NACRS	NACRS	CCRS	NPDUIS	NPDB
Man.	DAD	DAD	—	CCRS	NPDUIS	NPDB
Sask.	DAD	DAD	—	IRRS	NPDUIS	NPDB
Alta.	DAD	NACRS	NACRS	CCRS	NPDUIS	NPDB
B.C.	DAD	DAD	—	CCRS	NPDUIS	NPDB
Y.T., N.W.T., Nun.	DAD	DAD	NACRS (Yukon only)	CCRS (Yukon only)	NPDUIS (Yukon only)	—

Notes

* Only provinces or territories with mandatory emergency department Level 3 (clinical) data coverage are included.

† New Brunswick and Saskatchewan have transitioned to the interRAI Long-Term Care Facilities assessment instrument and report long-term care data to CIHI's Integrated interRAI Reporting System.

‡ Usage of Quebec pharmaceuticals data is restricted to designated products.

— Data not available.

DAD: Discharge Abstract Database.

HMDB: Hospital Morbidity Database.

NACRS: National Ambulatory Care Reporting System.

CCRS: Continuing Care Reporting System.

IRRS: Integrated interRAI Reporting System.

NPDUIS: National Prescription Drug Utilization Information System.

NPDB: National Physician Database.

Table 2 Summary of data sources and other technical specifications, by measure

Recommendation	Data sources	Study period	Jurisdictional coverage	Cohort age
Community care				
Diagnostic imaging for lower-back pain	DAD, NACRS, NPDB	2015–2016 to 2020–2021	Nova Scotia, Ontario, Manitoba, Alberta and British Columbia	18+
Cervical screening	CCHS	2008, 2012, 2017	All provinces and territories	18 to 24
Antibiotics dispensed in the community	NPDUIS	2015–2016 to 2020–2021	Manitoba, Saskatchewan and British Columbia	All ages
Chronic use of benzodiazepines and other sedative–hypnotics in older adults	NPDUIS	2014–2015 to 2020–2021	All provinces except Quebec	65+
Physical restraints in long-term care	CCRS/IRRS	2014–2015 to 2020–2021	Newfoundland and Labrador, Nova Scotia, New Brunswick, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and Yukon	All ages
Antipsychotics in long-term care	CCRS/IRRS, NPDUIS	2014–2015 to 2020–2021	Newfoundland and Labrador, Nova Scotia, New Brunswick, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and Yukon	All ages
Emergency department care				
Chest X-rays for asthma and bronchiolitis in emergency departments	NACRS	2014–2015 to 2020–2021	Ontario, Alberta and Yukon	Bronchiolitis: 1 month to 1 year Asthma: 3 to 17 years
Diagnostic imaging for minor head trauma in emergency departments	DAD, NACRS	2014–2015 to 2020–2021	Ontario, Alberta and Yukon	18 to 64

Recommendation	Data sources	Study period	Jurisdictional coverage	Cohort age
Hospital care				
Knee arthroscopy in adults age 60 and older	DAD, NACRS	2014–2015 to 2020–2021	All provinces and territories except Quebec	60+
Caesarean section in low-risk deliveries	DAD	2015–2016 to 2020–2021	All provinces and territories except Quebec	All maternal ages
Red blood cell transfusion in hospitalized patients*	DAD-HMDB	2014–2015 to 2020–2021	New Brunswick, Quebec, Ontario, Manitoba and Saskatchewan	18+
Preoperative tests for low-risk surgeries	DAD, NACRS, NPDB	2015–2016 to 2020–2021	Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia	18+

Notes

* Quebec does not support and is not linked to the Choosing Wisely Canada campaign, as it has launched its own Chantier de pertinence [Workstream on the relevance of care and services], which includes a series of actions that will aim to increase the appropriateness of the use of certain health care services and technologies in order to ensure the quality of care provided to the Quebec population and to promote a better use of resources. However, since the issues of overdiagnosis and overtreatment are of interest to Quebec, and in order to benefit from comparative data in this area, Quebec has agreed to have its data included in this product.

DAD: Discharge Abstract Database.
NACRS: National Ambulatory Care Reporting System.
NPDB: National Physician Database.
CCHS: Canadian Community Health Survey.
NPDUIS: National Prescription Drug Utilization Information System.
CCRS: Continuing Care Reporting System.
IRRS: Integrated interRAI Reporting System.
DAD-HMDB: Discharge Abstract Database–Hospital Morbidity Database.

Community care

Diagnostic imaging for lower-back pain

Recommendation

This is the recommendation from the College of Family Physicians of Canada and the Canadian Association of Radiologists:

Don’t do imaging for lower-back pain unless red flags are present.[2, 3]

Operational definition

This measure was reported for Alberta in the 2017 report *Unnecessary Care in Canada*. In the follow-up report, CIHI expanded the analysis to include data from Nova Scotia, Ontario, Manitoba, Alberta and British Columbia.

In alignment with the recommendation, this measure was calculated as the proportion of patients who got diagnostic imaging within 6 months of their initial visit to a family physician for lower-back pain (without red flags). For the interpretation of this measure, lower rates are favourable.

Lower-back pain

Patients with lower-back pain were defined as adults (age 18 and older) with a concern of lower-back pain who visited a family physician in the community (a physician’s office or a patient’s home). When identifying lower-back pain, the first 3 digits of the ICD-9 diagnostic codes were used (see Table 3 for the full list and description of ICD-9 codes).

For each patient, the first family physician visit with a diagnosis of lower-back pain in the fiscal year was selected as the index (initial) visit. Non-persistent back pain was distinguished from persistent back pain (defined in Table 5), as persistent lower-back pain was more likely to be an indication for imaging and was therefore excluded from the analysis.

Diagnostic imaging

For 6 months following the index family physician visits for lower-back pain, 3 types of diagnostic imaging were selected for inclusion: X-rays, computed tomography (CT) scans and magnetic resonance imaging (MRI) (see Table 4 for the full list of codes). X-rays, CT scans and MRI scans were identified in NACRS and NPDB data.

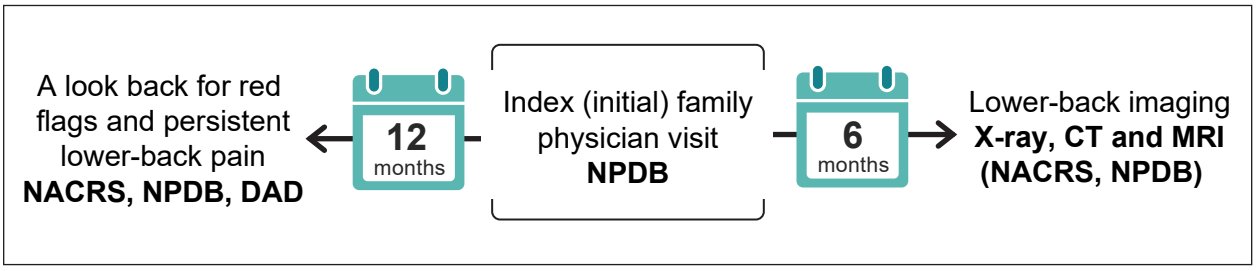
Red flags

Red flags are indications (or conditions) for which imaging for lower-back pain may be appropriate. Based on the red flags identified in the CWC recommendation,[2, 3] CIHI defined red flags as those appearing in the 365 days prior to an index visit. They included cancer, neurological problems, specific infections and vertebral compression fractures (see Table 6 for a detailed list of red flags). Patients with these red flags were removed from the analysis.

Methodology

A 6-month follow-up was used to identify lower-back imaging following the index family physician visit for lower-back pain. A 12-month lookback period was used to identify red flags and persistent lower-back pain prior to the index family physician visit.

Figure 1 Identifying lower-back imaging 6 months after index family physician visit for lower-back pain, 2015–2016 to 2020–2021



Notes
NACRS: National Ambulatory Care Reporting System.
NPDB: National Physician Database.
DAD: Discharge Abstract Database.
CT: Computed tomography.
MRI: Magnetic resonance imaging.

To understand variation associated with patient-level factors, breakdowns were explored by age, sex, income quintile and urban/rural residence.[i]

Data sources

- DAD: 2014–2015 to 2020–2021
- NACRS: 2014–2015 to 2020–2021
- NPDB: 2014–2015 to 2020–2021

Calculation

$$\text{Rate of lower-back pain imaging} = \frac{\text{Number of patients with at least one diagnostic image of the back}}{\text{Number of patients with lower-back pain}}$$

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The patient had a record with an invalid health card number;
- The patient had persistent lower-back pain in the 12 months prior to the index visit (see Table 5 for definition); and/or
- The patient had red flags in the 12 months prior to the index visit (see Table 6 for definition).

Risk adjustment

To support comparability across jurisdictions and across time, risk adjustment through logistic regression was performed, using age and sex.

Limitations

Lower-back pain may have been overestimated due to the use of 3-digit ICD-9 diagnosis codes; however, this overestimation was assessed to be minor. The analysis reflected a lack of specificity in the billing data, whereby imaging of the back could be identified but the exact segment of the back could not. This may have resulted in an overestimation of imaging rates. This was estimated to be minor, as most of the lower-back pain diagnoses were made by family physicians and these scans were most likely to be performed on the lower back.[4]

i. Neighbourhood income and place of residence (urban/rural) were derived from Statistics Canada's Postal Code OM Conversion File Plus (PCCF+) [computer program].

Administrative data does not capture the clinician's decision process and may not capture a patient's full clinical history. While efforts were made to identify and exclude patients with any indication for receiving diagnostic imaging, it was possible that some patients who were included required imaging from a clinical perspective and that this was not reflected in the data. In cases where a red flag may have been suspected by a clinician but not documented, these individuals would not have been removed from the analysis. Due to the limitations of administrative data, the analysis might not have captured all red flags that justified diagnostic imaging.

Comparisons between jurisdictions for analysis using billing data should be done with care due to differences in fee service codes, the identification of facility location and provincial funding models. Some provinces funded diagnostic imaging through regional health authorities and if some imaging clinics did not submit this imaging via shadow billing, it may have led to an underestimate of the imaging rate.

A small number of private clinics provide diagnostic imaging services (CT or MRI only). Since only publicly funded services could be captured by the NPDB and NACRS, there could have been a slight underestimation of MRI and CT imaging rates.

To ensure that all family physician visits for lower-back pain had 6 months of data following the index family physician visit for identifying the diagnostic imaging, the analysis of the 2020–2021 data (the first year of the COVID-19 pandemic) only compared the first 6 months, April 2020 to September 2020, against the same period in 2019.

Table 3 ICD-9 codes used to identify lower-back pain at family physician visits — National Physician Database

Definition	ICD-9 codes
Spondylosis and allied disorders	721
Intervertebral disc disorders	722
Other and unspecified disorders of back	724
Sprains and strains of sacroiliac region	846 (not applicable to Ontario)
Sprains and strains of other and unspecified parts of back	847

Note
ICD-9: *International Classification of Diseases, Ninth Revision.*

Table 4 Codes to identify diagnostic imaging

Imaging type	X-ray	CT	MRI
Billing codes, by province: For imaging captured in the NPDB			
Nova Scotia	16.83, R105, R110, R115, R120, R125, R126, R140, R150, R151, R152, R3105, R3110, R3115, R3120, R3150, R3151, R5105, R5110, R5115, R5120, R5150, R5151, 16.89A	R1169, R1170, R1172, R3169, R5169	R1440, R1441, R1442, R1445, R1446, R1447, R1450, R1451, R1452, R3440, R3442, R3447 R4445, R5440, R5442, R5447, R6445, 02.76
Ontario	X025, X027, X028, X031, X032, X033, X034, X202, X203, X204, X205, X206, X207	X128, X415, X416	X490, X492, X493, X495, X496, X498
Manitoba	7034, 7035, 7036, 7037, 7038, 7042, 7043, 7054, 7057, 7061, 7193, 7194, 7277, 7341, 7402	7227, 7228, 7229	7519, 7520, 7521, 7522, 7523, 7524, 7525, 7526, 7527, 7528
Alberta	X55, X56, X57, X57A, X58, X58E, X59, X60, X61, X62, X63, X64, X65, X66, X66A, X67	n/a	n/a
British Columbia	08540, 08541, 08542, 08543, 08549, 08546, 08548	08693, 08694, 08695	00462, 03227, 51030
CCI codes: For imaging captured in NACRS			
All provinces	3.SC.10, 3.SE.10, 3.SF.10 3.SC.12, 3.SE.12, 3.SF.12	3.SC.18, 3.SF.18, 3.SC.20, 3.SF.20	3.SC.40, 3.SF.40

Notes
n/a: Not applicable
CT: Computed tomography.
MRI: Magnetic resonance imaging.
NPDB: National Physician Database.
CCI: *Canadian Classification of Health Interventions*.
NACRS: National Ambulatory Care Reporting System.

Table 5 Identifying persistent lower-back pain

Indication of persistent lower-back pain	Identification in the data
Previous visit to a family physician for lower-back pain (NPDB)	Visit to a physician for lower-back pain 1 to 365 days prior to selected lower-back pain visit (ICD-9: 721, 722, 724, 846, 847) (ICD-9 for Ontario: 721, 722, 724, 739, 847)
Back problem in previous admission to an acute or emergency centre (DAD and NACRS)	Admission to an acute or emergency facility 1 to 365 days prior to selected lower-back pain visit, with any of the following diagnoses relating to the back ICD-10-CA: M43.27, M43.28, M46.36, M46.37, M46.46, M46.47, M47.86, M47.87, M47.88, M47.96, M47.97, M47.98, M48.06, M48.07, M48.96, M48.97, M51.1, M51.2, M51.3, M51.9, M53.26, M53.27, M53.28, M53.3, M53.86, M53.87, M53.88, M54.3, M54.4, M54.5, M54.8, M54.9, M99.03, M99.04, M99.83, M99.84, M99.93, M99.94, S33.5, S33.6, S33.7 and M43.9, M43.96, M43.97, M43.98 (not applicable to Ontario)

Indication of persistent lower-back pain	Identification in the data
Previous visit to a neurosurgeon or orthopedic surgeon for spinal surgery (NPDB, DAD and NACRS)	Visits to neurosurgeons or orthopedic surgeons or visits for spinal surgeries 1 to 365 days prior to the index visit • Specialty codes for neurosurgeons and orthopedic surgeons: - Nova Scotia — 025, 25, 023, 23 - Manitoba — 045, 046 - Alberta — 280, 335 - British Columbia — 009, 010 - Ontario — 04 Billing code starting with 16 for Nova Scotia and Alberta The following billing codes for neurosurgery visits for Ontario: A043, A044, A045, A046, C042, C043, C044, C045, C046, C047, C048, C049 • Spinal surgeries (NACRS and DAD CCI codes): 1.AW, 1.SC, 1.SE, 1.SF, 1.SG, 1.SH, 1.SI, 1.SJ The following orthopedic surgery billing codes for Ontario: A063, A064, A065, A066, C062, C063, C064, C065, C066, C067, C068, C069 Physician specialty code “06” for Ontario The following spinal operation billing codes for Ontario: E533, E534, E535, E536, E548, E549, E554, E562, E565, E566, E567, E568, E570, E573, E574, E897, E901, E909, E910, E913, E914, E915, E920, E924, E926, E928, E929, F103, F105, F107, M137, N126, N182, N185, N186, N192, N194, N195, N196, N197, N248, N313, N314, N317, N318, N319, N320, N321, N323, N324, N329, N330, N331, N332, N333, N334, N335, N336, N337, N338, N339, N340, N341, R234, R251, R252, R254, R264, R270, R271, R274, R275, R296, R303, R310, R336, R346, R348, R350, R356, R357, R358, R359, R361, R362, R368, R369, R370, R371, R373, R374, R397, R419, R447, R450, R451, R452, R455, R457, R459, R461, R464, R493, R494, R634, R635, R636, S312, Z215, Z219, Z226, Z228, Z236, Z241, Z244, Z662, Z800, Z810, Z817, Z823, Z868
Previous diagnostic imaging of the spine (NPDB, DAD and NACRS)	Spinal imaging 1 to 365 days prior to the index visit in the DAD, NACRS and the NPDB (see Table 4 for codes) For Ontario, this also includes the following to identify spinal imaging. Billing codes EMG: G455, G456, G457, G458, G459, G465, G466, G467, G469 Other tests on spine: G368, G386, J006, J011, J020, J030, J038, X057, X058, X080, X081, X164, X173, Z454 DAD and NACRS CCI codes CT: 3.SE.18, 3.SE.20 MRI: 3.SE.40

Notes
NPDB: National Physician Database.
ICD-9: *International Classification of Diseases, Ninth Revision*.
DAD: Discharge Abstract Database
NACRS: National Ambulatory Care Reporting System.
ICD-10-CA: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada*.
CCI: *Canadian Classification of Health Interventions*.
EMG: Electromyography.
CT: Computed tomography.
MRI: Magnetic resonance imaging.

Table 6 Red flag exclusion criteria

Red flag category	ICD-9 (NPDB)	ICD-10-CA (NACRS and DAD)
Cancer/history of cancer	140–208, 230–239, V10, V580, V581 For Ontario: 140–239	C00–C97, D00–D09, D37–D48, Z51.0, Z51.1, Z85, Z86 For Ontario: C00–D49, Z85, Z86, Z51.0, Z51.1
Neurological problems	323, 331, 332, 333, 334, 337, 340, 341, 342, 344, 345, 348, 349, 350, 351, 353, 357, 358, 359, 728, 781, 787, 788 For Ontario: 323, 331, 332, 333, 334, 337, 340, 341, 342, 344, 345, 348, 349, 350, 351, 353, 357, 358, 359	M62.9, R56, R29.8, R15, R32, G40, G30, G31, G32, G20–G26, G35, G96.1, G96.8, G96.9, G97, G98, G93, G82, G83, G90, G04, G05, G37, G81, G11, G54, G61, G62.0, G62.1, G62.2, G51, G50, G70, G71, G72 For Ontario: G04, G05, G11, G20–G26, G30, G31, G32, G35, G37, G40, G50, G51, G54, G61, G62.0, G62.1, G62.2, G70, G71, G72, G81, G82, G83, G90, G93, G96.1, G96.8, G96.9, G97, G98, R56.8
Specific infections/fever 3 months prior to back pain visit	010–018, 038, 730, 997, 998, 720 For Ontario: 010, 011, 012, 015, 017, 038, 720, 730, 998	A15–A19, A40, A41, M86, M46.2, M89.6, T87.4, T81.4, G06.2, G06.1, M46.3, M46.5
Vertebral compression fracture	733	M84.48, M90.7 (M80.0 to M80.9 with a 5th digit of “8”) For Ontario: M84.48, M90.7, M80.08, M80.88

Notes
ICD-9: *International Classification of Diseases, Ninth Revision*.
NPDB: National Physician Database.
ICD-10-CA: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada*.
NACRS: National Ambulatory Care Reporting System.
DAD: Discharge Abstract Database.

Cervical screening

Recommendation

This is the recommendation of the College of Family Physicians of Canada and the Canadian Task Force on Preventive Health Care:

Don’t screen with Pap smears if under 25 years of age[ii] or over 69 years of age.[2]

Operational definition

The Canadian Partnership Against Cancer (CPAC) performed the analysis to measure cervical screening to estimate low-value care in relation to the recommendation on Pap tests among certain age groups. Based on CCHS data availability, the screening rate could not be assessed for those over age 69. The cohort was restricted to women[iii] age 18 to 24 to align with the recommendation.

This measure was calculated as the proportion of women age 18 to 24 who reported having a Pap test within the past 3 years. For the interpretation of this measure, lower rates are favourable.

Pap tests

Pap tests were identified by using self-reported survey data, selecting respondents who reported that they were a woman age 18 to 24 who had undergone a Pap test in the past 3 years.

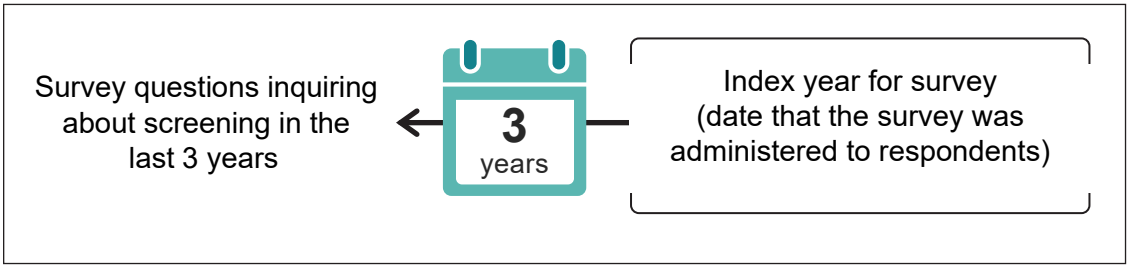
ii. The Nurse Practitioner Association of Canada makes the same recommendation. A similar recommendation also exists from the Society of Obstetricians and Gynaecologists of Canada and the Canadian Association of Pathologists, in which the recommendation is for those younger than age 21.

iii. Inclusion was limited to respondents who self-reported as “women,” although recommendations for cervical screening extend to all people with a cervix, irrespective of their gender identity.

Methodology

Respondents were surveyed on whether they had ever had a Pap test, and when their last Pap test occurred. The proportion of women age 18 to 24 who had had a Pap test in the past 3 years was identified out of all women age 18 to 24.

Figure 2 Survey of Pap test within last 3 years among women age 18 to 24 (survey years 2008, 2012 and 2017)



Questions about this measure can be emailed to sp-info@partnershipagainstcancer.ca.

Data source

- CCHS: 2008, 2012, 2017

Calculation

$$\text{Rate of Pap tests among women age 18 to 24} = \frac{\text{Number of respondents reporting that they are a woman age 18 to 24 who had had a Pap test in the past 3 years}}{\text{Number of respondents reporting that they are a woman age 18 to 24}}$$

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The respondent reported having a complete hysterectomy; and/or
- The respondent reported “don’t know,” “refusal” or “not stated” to the questions about having a Pap test, or about having a complete hysterectomy.

Limitations

Recommendations for cervical cancer screening varied by jurisdiction. Some jurisdictions still begin screening as early as age 21 and it is sometimes done more or less often than the recommendation of every 3 years. Details on cervical screening guidelines by jurisdiction and over time can be found in Table 7.

Due to redesign of the CCHS survey, information on Yukon, the Northwest Territories and Nunavut after 2015 was available only for a 2-year combined period. Thus, the 2017 data for the territories included combined 2017 and 2018 data.

Supplementary analysis: Predictive modelling for HPV primary screening

CPAC applied its OncoSim-Cervical microsimulation model of cervical cancer to predict population- and system-level outcomes of transitioning from Pap testing to human papillomavirus (HPV) primary screening in 2025. Details for the modelling tool can be found in CPAC's OncoSim-Cervical fact sheet.

The analysis was conducted to compare 2 different scenarios using these model versions: OncoSim-Cervix version 3.3.4.0 and HPV Microsimulation Model version 1.9.1.0. The first scenario that CPAC examined was the "control" or base case, which it called the Status Quo Model. The second scenario examined was the ideal future situation, which CPAC called the HPV Screening Program Model. The Status Quo Model inputs included primary Pap testing from age 21 to 69 every 3 years, with 76.6% screening participation and 70% HPV vaccine coverage. The HPV Screening Program Model inputs included primary oncogenic HPV testing from age 25 to 69 every 5 years, with 90% screening participation by 2030 and 90% HPV vaccine coverage by 2025. For both models, the quadrivalent vaccine was applied until 2017 and the nonavalent vaccine was applied from 2018 and onward.

Table 7 Guidelines for age of Pap test initiation by jurisdiction and survey year

Survey year	Guidelines for age of Pap test initiation by jurisdiction*
2008	Screening across all jurisdictions began at initiation of sexual activity
2012	Screening began at age 21: All provinces and territories
2017	Screening began at age 21: All provinces and territories except Alberta and British Columbia Screening began at age 25: Alberta and British Columbia

Note

* As of 2022, organized screening is not currently available in Quebec, Yukon, the Northwest Territories or Nunavut, although it does occur opportunistically and the opportunistic screening is assumed to be aligned with the guidelines. In 2012 in New Brunswick, opportunistic screening was available, and a formal screening program was initiated in 2014. In Prince Edward Island, an organized screening program has existed since 2001, although screening remains primarily opportunistic.

Antibiotics dispensed in the community

Recommendation

Judicious and appropriate use of antibiotics has been recommended by several clinician societies in Canada,[iv] advising against their use in circumstances where they often offer little to no benefit, such as ear infections in children,[5] urinary tract infections in older people[6] and respiratory infections.[2]

Operational definition

An existing measure from the Organisation for Economic Co-operation and Development (OECD) was used to estimate low-value care in relation to the recommendations from various clinician societies on antibiotic prescribing.

The OECD reports on international comparisons of the total volume of antibiotics for systemic use, using the measure of defined daily dose (DDD).[7] The analysis for this report was aligned to the OECD methodology, with results for Manitoba, Saskatchewan and British Columbia, based on data availability. Trends in overall prescribing rates were used to measure progress in reducing antibiotics for systemic use.

This measure was calculated as the total volume of antibiotics in DDDs dispensed in community pharmacies per day (regardless of diagnosis), divided by the population. For the interpretation of this measure, lower rates are favourable.

Defined daily dose

For each pharmaceutical claim, DDDs were calculated by multiplying the total quantity of the drug (e.g., number of tablets) by the strength (e.g., milligrams per tablet) to obtain the total number of milligrams, and then dividing by the drug-specific DDD to obtain the total number of DDDs. Drug-specific DDDs are assigned by the World Health Organization (WHO).[8] More information on DDDs can be found on the WHO's web page Defined Daily Dose (DDD).

Methodology

In alignment with the OECD methodology, this measure included all public and private claims for antibiotics for systemic use dispensed in community pharmacies. The overall volume of DDDs of antibiotics was calculated per 1,000 population using population estimates from Statistics Canada as the provincial population base.[9]

iv. These societies include the Canadian Association of Emergency Physicians, Canadian Society of Otolaryngology - Head & Neck Surgery, Pediatric Otolaryngology Subspecialty Interest Group, Canadian Thoracic Society, Canadian Dermatology Association, Canadian Nurses Association, College of Family Physicians of Canada, Canadian Society of Allergy and Clinical Immunology, and Association of Medical Microbiology and Infectious Disease Canada.

Antibiotics for systemic use were identified as drugs with the Anatomical Therapeutic Chemical code of J01, and pharmacological subgroups were explored using the first 4 characters of the Anatomical Therapeutic Chemical code. Antibiotic subgroups are listed in Table 8.

To understand variation associated with patient-level factors and medication type, breakdowns were explored by age, sex and antibiotic category.

Data sources

- NPDUIS: 2015–2016 to 2020–2021
- Statistics Canada, Table 17-10-0005-01, Population estimates on July 1st, by age and sex[9]

Calculation

$$\text{Total volume of antibiotics for systemic use} = \frac{([\text{Total number of DDDs of systemic antibiotics} \div \text{Population}] \times 1{,}000)}{365}$$

Age standardization

To support comparability across Manitoba, Saskatchewan and British Columbia and across time, age standardization was performed using the 2016 population structure of the 3 provinces combined.

Limitations

NPDUIS does not include information regarding diagnoses or conditions for which prescriptions were written. As a result, this measure did not distinguish between cases of systemic antibiotic use for appropriate indications versus cases where antibiotic use may have been of low value.

Dispensed medications from community pharmacies were included regardless of whether the patient used the drugs. The analysis did not include prescriptions that were never filled, or drugs provided during acute hospitalization.

Table 8 Subgroups of antibiotics for systemic use

Subgroups of antibiotics for systemic use	ATC 4-character code
Tetracyclines	J01A
Amphenicols	J01B
Beta-lactam antibacterials, penicillins	J01C
Other beta-lactams	J01D
Sulfonamides and trimethoprims	J01E
Macrolides, lincosamides and streptogramins	J01F
Quinolones	J01M
Other antibiotics	J01G, J01R, J01X

Note
ATC: Anatomical Therapeutic Chemical.

Chronic use of benzodiazepines and other sedative–hypnotics in older adults

Recommendation

This is the recommendation of the Canadian Academy of Geriatric Psychiatry, the Canadian Society of Hospital Medicine, the Canadian Psychiatric Association and the Canadian Geriatrics Society:

Don’t use benzodiazepines or other sedative–hypnotics in older adults as the first choice for insomnia,[v] agitation or delirium.[6, 10, 11]

The Canadian Pharmacists Association and Canadian Society of Hospital Pharmacists made similar recommendations.[12]

Operational definition

This measure was reported in the 2017 report *Unnecessary Care in Canada*. In the follow-up report, CIHI revised the analysis to include an updated definition for chronic use, and a refined list of benzodiazepines and sedative–hypnotics, although the intent of the measure remained the same. Trends in rates for overall chronic use of benzodiazepines and sedative–hypnotics among older adults were used to measure progress in reducing overuse. The analysis focused on chronic use because, for older adults who do require benzodiazepines and other sedative–hypnotics after trying behavioural treatments, these medications should be prescribed for a short duration — no more than 4 weeks.[13]

NPDUIS identifies claims that were funded by public drug programs, either toward a deductible or for reimbursement in all Canadian provinces (except Quebec, where data usage is restricted) and in Yukon. Yukon was not included in this analysis due to limitations in its information quality.

This measure was calculated as the proportion of older adults with at least one claim to the public drug program in which the person had chronic benzodiazepine or other sedative–hypnotic use. For the interpretation of this measure, lower rates are favourable.

v. The recommendation by the Canadian Psychiatric Association does not include agitation or delirium.

Older adults

Older adults were defined as those age 65 and older, and only those with at least one drug claim for any drug were included.

Benzodiazepines and other sedative–hypnotics

Drugs were identified in NPDUIS using Anatomical Therapeutic Chemical codes defined by the WHO. See Table 9 for the list of benzodiazepines and other sedative–hypnotics included in this analysis. The medications included are aligned with those specified in the CWC toolkits on reducing the inappropriate use of benzodiazepines and sedative–hypnotics among older adults.[14, 15]

Chronic use of benzodiazepines and other sedative–hypnotics

Older adults with chronic use of benzodiazepines or other sedative–hypnotics were defined as those who had more than a 30-day supply of a benzodiazepine or other sedative–hypnotic within the quarter of interest, and the quarter immediately prior.

Methodology

Quarterly rates of chronic benzodiazepine or other sedative–hypnotics use were calculated as the number of older adults with chronic use divided by the number of active beneficiaries and expressed as a percentage. The annual total number of older adults with chronic use was calculated as the average of 4 quarterly totals. Annual rates were calculated as the weighted average of 4 quarterly rates.

To understand variation associated with patient-level factors and prescribing, breakdowns were explored by age, sex and neighbourhood income quintile.[vi]

Data source

- NPDUIS: 2013–2014 to 2020–2021

Calculation

$$\text{Rate of chronic use} = \frac{\text{Total number of older adults with chronic benzodiazepine or other sedative–hypnotic use}}{\text{Total number of older adults with at least one claim in the public drug program}}$$

vi. Neighbourhood income was derived from Statistics Canada's PCCF+.

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The patient was younger than 65 at the time of the index claim.
- The claim was for 0 day's supply.
- In contrast to the 2017 report, midazolam was excluded from this analysis based on expert recommendations and to align with the CWC toolkits on the judicious use of benzodiazepines and sedative–hypnotics.[14, 15]

Age standardization

To support comparability across jurisdictions and across time, age standardization was performed using the 2016 older adult (age 65 and older) population structure of all provinces combined (except Quebec), by 5-year age group. All active beneficiaries (the denominator) were taken as the standard population.

Limitations

NPDUIS does not contain information regarding diagnoses or other indications for the drugs prescribed. As a result, all benzodiazepine and other sedative–hypnotic claims were included; the analysis could not be limited to use for insomnia, agitation or delirium. Based on previous research, primary insomnia was expected to account for a large proportion of overall benzodiazepine use.[16] The analysis was also not specific to the drugs being prescribed as a first choice for a particular condition.

Formulary coverage is largely similar across the provinces, with most of the benzodiazepines and sedative–hypnotics being covered as full benefits. However, there is 1 notable exception. Zopiclone is not covered in Saskatchewan, and its coverage is restricted in Ontario and British Columbia to the treatment of insomnia in patients who are not responsive to or who are intolerant of other benzodiazepines or sedative–hypnotics, or for those with insomnia and other specific concurrent diagnoses. In these provinces, zopiclone use is likely under-captured in public drug program data.

The denominator was selected as the total number of claimants to the public drug program who were age 65 and older, rather than a population-based denominator. This was chosen given that not all older adults are covered by public drug programs, and also to align with the methodology used in the 2017 report *Unnecessary Care in Canada*.

The proportion of the total older adult population in each jurisdiction represented in the database (i.e., with accepted claims from public drug programs) varied from 51% in Newfoundland and Labrador to 94% in Saskatchewan and Ontario.[17] Comparing rates between jurisdictions should be done with care since public drug program design differs between jurisdictions. For example, Newfoundland and Labrador, Nova Scotia and New Brunswick provide coverage to smaller proportions of older adults than those in other jurisdictions, and rates for these provinces may not represent the total older adult population. The analysis included older adults living in long-term care homes; however, the coverage of older adults in long-term care homes within NPDUIS varies across jurisdictions.

Yukon was excluded from this analysis due to limitations in the quality of information. New Brunswick data for January to March 2021 was excluded due to data quality issues. Nova Scotia did not submit data for April to June 2020.

CIHI's OECD Interactive Tool reports the rate of chronic use of benzodiazepine and other related drugs in adults age 65 and older, and defines chronic use as having prescriptions of more than 365 supply days.[18]

Table 9 List of benzodiazepines and other sedative–hypnotics included in the analysis

Benzodiazepine and sedative–hypnotic drugs	ATC code
Diazepam	N05BA01
Chlordiazepoxide	N05BA02
Potassium clorazepate	N05BA05
Lorazepam	N05BA06 and N05BA56
Oxazepam	N05BA04
Bromazepam	N05BA08
Alprazolam	N05BA12
Flurazepam	N05CD01
Nitrazepam	N05CD02
Triazolam	N05CD05
Temazepam	N05CD07
Zopiclone	N05CF01
Zolpidem	N05CF02
Clonazepam	N03AE01
Trazodone	N06AX05
Quetiapine (low dose only*)	N05AH04

Notes

* Low-dose quetiapine usage is defined as usage by a person who had claims for quetiapine of 50 mg per day or less in a given quarter. This cut-off was used to better capture quetiapine usage for the purposes of treating insomnia, agitation or delirium.

ATC: Anatomical Therapeutic Chemical.

Physical restraint use in long-term care

Recommendation

This is the recommendation from the Canadian Nurses Association and the Canadian Gerontological Nursing Association:

Don’t use restraints with older persons unless all other alternatives have been explored.[19]

Operational definition

An existing indicator from CIHI’s Your Health System, Restraint Use in Long-Term Care, was used to estimate low-value care in relation to the recommendation on restraint use for older persons. Provincial-, regional- and facility-level results of this measure are published in CIHI’s Your Health System: In Depth and Quick Stats tools. The measure was limited to daily physical restraints only, and the data does not capture whether alternative options were explored prior to the use of the physical restraint.

This measure was calculated as the proportion of eligible long-term care assessments in which the assessment indicated daily physical restraints. For the interpretation of this measure, lower rates are favourable.

Physical restraints

This measure included physical restraints in long-term care within the following 3 categories: trunk restraints, limb restraints and chair prevents rising restraints. Examples of these types of physical restraints include a seatbelt at mealtime, a bed rail or a chair that prevents a person from standing up.

Methodology

This indicator examined the percentage of long-term care residents in daily physical restraints. It was calculated by dividing the number of assessments indicating residents who were in daily physical restraints by the total number of assessments (excluding those for comatose or quadriplegic residents). As part of CIHI’s suite of long-term care quality indicators in

Your Health System, the methodology used 4 rolling quarters of data for calculations in order to have a sufficient number of assessments for risk adjustment. Since residents are assessed on a quarterly basis, each resident may contribute to the indicator up to 4 times in a year.

Assessments were included if they were the latest assessment in the quarter, were carried out more than 92 days after the admission date and were not the resident's admission full assessment (RAI-MDS 2.0) or first assessment (interRAI LTCF).

Full details on the methodology can be found on CIHI's Indicators page for the indicator Restraint Use in Long-Term Care.

Additional characteristics were explored using stratification, and included the following breakdowns:

- Age
- Sex
- Depression Rating Scale[vii]
- Cognitive Performance Scale
- Index of Social Engagement Scale
- Aggressive Behaviour Scale
- Activities of Daily Living Self-Performance Hierarchy Scale

Data sources

- CCRS: 2014–2015 to 2020–2021
- IRRS: 2020–2021

Use of daily physical restraints is reported in long-term care resident assessments submitted to CIHI's CCRS and IRRS databases.

- Newfoundland and Labrador, Nova Scotia, Ontario, Manitoba, Alberta, British Columbia and Yukon use the RAI-MDS 2.0 to assess long-term care residents and submit data through CCRS.
- Saskatchewan assessed its long-term care residents using the RAI-MDS 2.0 and submitted its data to CCRS before 2019–2020. Saskatchewan transitioned to the interRAI LTCF in 2019–2020 and began submitting data to IRRS at that time. Most of Saskatchewan's assessments were not included in the 2019–2020 analysis due to the assessment tool transition but were included in the other fiscal years.
- New Brunswick has submitted its data from interRAI LTCF assessments to IRRS since 2017–2018. New Brunswick was included only in the 2020–2021 analysis.
- IRRS was used only in the 2020–2021 analysis for Saskatchewan and New Brunswick.

vii. Resident characteristics and outcome scales, such as the Depression Rating Scale, were from the RAI-MDS 2.0. More information can be found in the CIHI's *Describing Outcome Scales (RAI-MDS 2.0)*.

Calculation

$$\text{Percentage of long-term care residents in daily physical restraints} = \frac{\text{Number of assessments indicating daily physical restraints}}{\text{Total number of eligible assessments}}$$

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The resident was comatose; and/or
- The resident was quadriplegic.

Risk adjustment

To support comparability across jurisdictions and across time, multiple steps of risk adjustment were applied, using CIHI's long-term care quality indicators risk adjustment methodology.[20]

For this indicator, the data was stratified by activities of daily living and then reweighted using direct standardization. The standard reference population included 3,000 facilities in 6 U.S. states and 92 residential care facilities and continuing care hospitals in Nova Scotia and Ontario.

Limitations

The measure was limited to physical restraints only and does not include environmental or chemical restraints. The RAI-MDS 2.0 and interRAI LTCF assessment data does not capture whether alternative options were explored prior to the use of the physical restraint.

Results for New Brunswick were included only in 2020–2021 from IRRS and data from Saskatchewan was submitted to CCRS until 2018–2019, and transitioned to IRRS by 2020–2021. This was due to the transition to the interRAI LTCF, which may capture more granular data on restraint use compared with the RAI-MDS 2.0. Provincial results for Manitoba (Winnipeg Regional Health Authority) and Nova Scotia (Central Zone) were not profiled independently due to incomplete data coverage but were included in the overall rate. Provincial results for Saskatchewan were not profiled for 2019–2020 given the transition to IRRS, but assessment data reported to CCRS was included in the overall rate.

The analysis was performed at the assessment level, as a proxy for the proportion of individual residents with daily restraints.

CIHI recognizes that the COVID-19 pandemic has affected many long-term care homes across Canada, including their ability to complete assessments and/or submit data to CIHI. Available data may vary by jurisdiction and facility. The 2020–2021 results should be interpreted in the context of the COVID-19 pandemic.

Antipsychotic use in long-term care

Recommendation

This is the recommendation from the Canadian Nurses Association and the Canadian Gerontological Nursing Association:

Don’t use restraints with older persons unless all other alternatives have been explored.[viii]

Operational definition

An existing indicator from CIHI’s Your Health System, Potentially Inappropriate Use of Antipsychotics in Long-Term Care, was used to estimate low-value care in relation to the recommendations on restraints — exploring the potentially inappropriate use of antipsychotics from the perspective of its possible use as a form of chemical restraint. Provincial-, regional- and facility-level results of this measure are published in CIHI’s Your Health System: In Depth and Quick Stats tools.

This measure was calculated as the proportion of eligible long-term care assessments in which the assessment indicated antipsychotic use in a resident without a diagnosis of psychosis. For the interpretation of this measure, lower rates are favourable.

Methodology

This indicator examined the percentage of long-term care residents taking antipsychotic drugs without a diagnosis of psychosis. It is calculated by dividing the number of assessments for residents who received antipsychotic medication by the total number of assessments (excluding those with schizophrenia, Huntington chorea, delusions and hallucinations, and end-of-life residents). As part of CIHI’s suite of long-term care quality indicators, the methodology uses 4 rolling quarters of data for calculations in order to have a sufficient number of assessments for risk adjustment. Since residents are assessed on a quarterly basis, each resident can contribute to the indicator up to 4 times in a year.

viii. The Canadian Geriatrics Society, Canadian Society for Long Term Care Medicine, Canadian Nurses Association, Canadian Academy of Geriatric Psychiatry and the Canadian Psychiatric Association all have recommendations not to use antipsychotics as the first choice to treat symptoms of dementia.[6, 11, 19]

Assessments were included if they were the latest assessment in the quarter, were carried out more than 92 days after the admission date and were not the resident's admission full assessment (RAI-MDS 2.0) or first assessment (interRAI LTCF).

Full details on the methodology can be found on CIHI's Indicators page for the indicator Potentially Inappropriate Use of Antipsychotics in Long-Term Care.

Additional characteristics were explored using stratification and included the following breakdowns:

- Age
- Sex
- Depression Rating Scale[ix]
- Cognitive Performance Scale
- Index of Social Engagement Scale
- Aggressive Behaviour Scale
- Activities of Daily Living Self-Performance Hierarchy Scale

Additional analyses were performed linking the long-term care data to NPDUIS to obtain more details on the provincial profile of antipsychotics prescribed for long-term care residents who had an assessment coded as being prescribed a potentially inappropriate antipsychotic.

- For residents flagged with potentially inappropriate antipsychotic use in 2019–2020, corresponding claims for antipsychotics in NPDUIS were identified. The frequency of the top 5 antipsychotic drug types by Anatomical Therapeutic Chemical level 5 was calculated at the claims level.

ix. Resident characteristics and outcome scales, such as the Depression Rating Scale, were from the RAI-MDS 2.0. More information can be found in the CIHI's *Describing Outcome Scales (RAI-MDS 2.0)*.

Data sources

- CCRS: 2014–2015 to 2020–2021
- IRRS: 2020–2021
- NPDUIS: 2019–2020

The use of potentially inappropriate antipsychotics is reported in long-term care resident assessment data submitted to CIHI's CCRS and IRRS.

- Newfoundland and Labrador, Nova Scotia, Ontario, Manitoba, Alberta, British Columbia and Yukon use the RAI-MDS 2.0 to assess long-term care residents and submit data to CCRS.
- Saskatchewan assessed its long-term care residents using the RAI-MDS 2.0 and submitted its data to CCRS before 2019–2020. Saskatchewan transitioned to the interRAI LTCF in 2019–2020 and began submitting to IRRS at that time. Most of Saskatchewan was not included in 2019–2020 analysis due to the assessment tool transition, but it was included in the other fiscal years.
- New Brunswick has submitted its data from interRAI LTCF assessments to IRRS since 2017–2018. New Brunswick was included in the 2020–2021 analysis only.
- IRRS was used only in the 2020–2021 analysis for New Brunswick and Saskatchewan.

Calculation

$$\text{Percentage of long-term care residents with potential inappropriate use of antipsychotics} = \frac{\text{Number of assessments indicating inappropriate antipsychotics}}{\text{Total number of eligible assessments}}$$

Exclusions

Assessments were excluded if one or more of the following circumstances was present:

The resident

- Had end-stage disease;
- Was receiving hospice or palliative care;
- Had a diagnosis of schizophrenia;
- Had a diagnosis of Huntington chorea;
- Experienced hallucinations; and/or
- Experienced delusions.

Risk adjustment

To support comparability across jurisdictions and across time, multiple steps of risk adjustment were applied, using CIHI's long-term care quality indicators risk adjustment methodology.[20]

For this indicator, the data was stratified by Case Mix Index. It was then adjusted using logistic regression for individual covariates, including motor agitation, a moderate or impaired decision-making problem, a long-term memory problem, Cognitive Performance Scale, a combination of Alzheimer disease and other dementia, and/or age younger than 65.

The data was then reweighted using direct standardization. The standard reference population included 3,000 facilities in 6 U.S. states and 92 residential care facilities and continuing care hospitals in Nova Scotia and Ontario.

Limitations

The measure addresses potentially inappropriate antipsychotic use in long-term care from the perspective of its possible use as a chemical restraint; however, it does not reflect whether other alternatives had been explored. This measure does not specifically address the recommendation not to use antipsychotics as a first choice to treat behavioural and psychological symptoms of dementia.

Results for New Brunswick were included only in 2020–2021 from IRRS and data from Saskatchewan was submitted to CCRS until 2018–2019 and transitioned to IRRS by 2020–2021. This was due to the transition to the interRAI LTCF, which may capture more granular data on antipsychotic use compared with the RAI-MDS 2.0. Provincial results for Manitoba (Winnipeg Regional Health Authority) and Nova Scotia (Central Zone) were not profiled independently due to incomplete data coverage but were included in the overall rate. Provincial results for Saskatchewan were not profiled for 2019–2020 given the transition to IRRS, but the assessment data reported to CCRS was included in the overall rate.

The analysis was performed at the assessment level as a proxy for the proportion of individual residents with inappropriate antipsychotic use.

CIHI recognizes that the COVID-19 pandemic has affected many long-term care homes across Canada, including their ability to complete assessments and/or submit data to CIHI. Available data may vary by jurisdiction and facility. The 2020–2021 results should be interpreted in the context of the COVID-19 pandemic.

Emergency care

Chest X-rays for asthma and bronchiolitis in emergency departments

Recommendation

As part of a suite of 5 pediatric recommendations released in 2013 for Choosing Wisely (U.S.), this is the recommendation from the U.S.'s Society of Hospital Medicine (Pediatric Committee):

Don't order chest radiographs in children with uncomplicated asthma or bronchiolitis.[21]

Operational definition

In a study by Reyes et al. (2017),[22] this recommendation was investigated using data across 32 hospitals participating in a pediatric health information system to identify the percentage of patients who had received a chest X-ray during hospitalization among those with uncomplicated asthma or bronchiolitis. The methods from Reyes et al. were replicated for this analysis to estimate low-value care in relation to the recommendation, but they were adapted to be specific to emergency department settings. This analysis used data on the pediatric population in Ontario, Alberta and Yukon.

For asthma, this measure was calculated as the proportion of emergency department visits for asthma (for those age 3 to 17) in which the patient had a chest X-ray. For bronchiolitis, this measure was calculated as the proportion of emergency department visits for bronchiolitis (for those age 1 month to 1 year) in which the patient had a chest X-ray. For the interpretation of these measures, lower rates are favourable.

Methodology

Records from emergency departments, including urgent care centres, were used to identify cases of asthma in children and bronchiolitis in infants.

Children age 3 to 17 with asthma were selected, excluding those younger than 3 due to difficulties in diagnosing asthma for children younger than 3.[22]

Infants age 1 month to less than 1 year with bronchiolitis were selected. Newborns younger than 1 month were excluded due to a higher likelihood of more severe bronchiolitis, while those age 1 year and older were excluded due to a higher probability of other causes of wheezing requiring chest X-rays.[22]

Cases were excluded where there were indications signalling that a chest X-ray may have been appropriate, such as for those with medical complexity or pneumonia.

Asthma and bronchiolitis diagnoses were identified using ICD-10-CA codes J45 and J21, respectively, in any problem field or discharge diagnosis field. A chest X-ray was identified on the same abstract using the following CCI codes in any intervention field: 3.GE.10, 3.GT.10 and 3.GY.10.

To understand the variation associated with patient-level factors and care, breakdowns were explored by age (in the case of asthma only), sex, triage level, ambulance use, hospital peer group, visit disposition and urban/rural residence.[x]

Data source

- NACRS: 2013–2014 to 2020–2021

Calculations

$$\text{Rate of chest X-rays for asthma} = \frac{\text{Number of emergency visits for patients with asthma who had a chest X-ray}}{\text{Number of emergency visits for patients with asthma}}$$

$$\text{Rate of chest X-rays for bronchiolitis} = \frac{\text{Number of emergency visits for patients with bronchiolitis who had a chest X-ray}}{\text{Number of emergency visits for patients with bronchiolitis}}$$

x. The place of residence (urban/rural) was derived from Statistics Canada's PCCF+.

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The patient had a medical complexity;[xi]
- The patient has pneumonia (ICD-10-CA codes J12 to J18) in the current visit;
- The patient has an invalid health card number;
- The sex of the patient is coded as other than male or female;
- The patient is dead on arrival;
- The patient's emergency department visit was scheduled; and/or
- The patient was transferred from or being transferred to another emergency department

2 additional exclusion criteria were applied to the bronchiolitis cohort:

- The patient had a record of bronchiolitis or a chest X-ray during any emergency department visit in the 3 months before the index visit; and
- The patient has asthma in the current visit.

Risk adjustment

In the trending and provincial variation analysis, the rate of chest X-ray was adjusted for patient age (for those with asthma only), sex and triage level.

Limitations

This analysis only covered chest X-rays performed in emergency departments and urgent care centres, and didn't reflect the rates of chest X-rays for hospitalized patients or for patients referred to radiology centres in the community. The exclusion criteria based on comorbidities may have removed some uncomplicated cases in error or may have missed some extenuating circumstances where clinical judgment would have correctly identified the need for a chest X-ray.

xi. "Medical complexity" was defined using the methodology for CIHI's report *Children and Youth With Medical Complexity in Canada*.[23]

Diagnostic imaging for minor head trauma in emergency departments

Recommendation

This is the Canadian Association of Emergency Physicians recommendation:

Don’t order CT head scans in adults and children who have suffered minor head injuries unless positive for a validated head injury clinical decision rule.[24]

The Canadian Association of Radiologists has a similar recommendation:

Don’t do imaging for minor head trauma unless red flags are present.[3]

Operational definition

This measure was reported in the 2017 report *Unnecessary Care in Canada*. As was done in the 2017 report, this analysis focused on an adult population, as assessing and treating children with head trauma is different from adult assessment and treatment.[25] Additionally, to take a broader scope in alignment with the recommendation from the Canadian Association of Radiologists, the analysis did not limit head imaging solely to CT, although CT scans did make up the vast majority of head imaging. The analysis was performed based on emergency department visits in Ontario, Alberta and Yukon.

This measure was calculated as the proportion of emergency department visits for minor head injury in adults age 18 to 64 without red flags in which the patient had diagnostic imaging of the head. For the interpretation of this measure, lower rates are favourable.

Minor head trauma

Minor head trauma is precipitated by an event associated with a physical injury to the head, resulting in symptoms consistent with a Glasgow Coma Scale[xii] (GCS) score of 13 to 15, as well as loss of consciousness, amnesia or disorientation.[24] Existing literature uses different terminologies and *International Statistical Classification of Diseases and Related Health Problems* codes to identify head trauma using administrative data. The codes used for head trauma in this analysis were adopted from a study by the Toronto Rehabilitation Institute[26] (see Table 10). That study is based on 15 studies from the WHO, the United States, Canada, Australia, New Zealand and several European countries.

Head imaging

Brain and cranial CT, X-ray or MRI imaging administered in the emergency department were included (see Table 13 for CCI codes).

Indications for head imaging

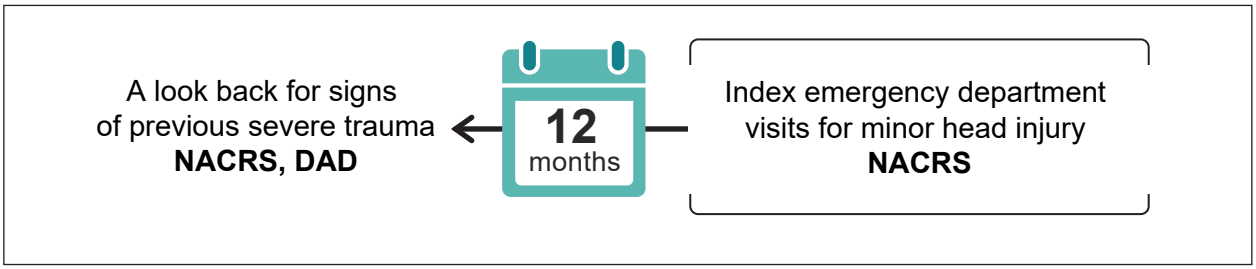
The use of clinical decision tools, such as the Canadian CT Head Rule,[27] can identify when head imaging is necessary in adults and when it is of low value. A set of red flags were used in this analysis where head imaging may have been warranted, and were based on the Canadian CT Head Rule and consultations with CWC clinical advisors. Emergency department records with these red flags were removed from the analysis, where possible, to exclude cases in which head imaging may have been necessary (see the following Exclusions section as well as Table 11).

Methodology

Analysis was restricted to the adult population (age 18 to 64) who had an unplanned visit to the emergency department for a minor head injury. Older adults (age 65 and older) were excluded based on the Canadian CT Head Rule[27] and associated CWC recommendations.[3, 24] Visits between 2014–2015 and 2020–2021 were included for Ontario, Alberta and Yukon. Only instances of diagnostic imaging performed in the same visit where the patient was presenting for concerns of minor head injury were included. In addition to excluding cases with red flags, cases were excluded if patients had signs of severe trauma during any emergency department visit or hospital admission in the 12 months before the index visit.

xii. The GCS is a validated tool to assess the level of consciousness in a person and an important element for evaluating the severity of head trauma.

Figure 3 Head imaging for minor head trauma in adults with unplanned emergency department visits, 2014–2015 to 2020–2021



Notes
NACRS: National Ambulatory Care Reporting System.
DAD: Discharge Abstract Database.
Alt text: See the appendix for the text alternative for this visual.

To understand the variation associated with patient-level factors and care, breakdowns were explored by age, sex, neighbourhood income quintile, urban/rural residence,[xiii] triage level and ambulance use.

Data sources

- DAD: 2013–2014 to 2020–2021
- NACRS: 2013–2014 to 2020–2021

Calculation

$$\text{Rate of head imaging for minor trauma} = \frac{\text{Number of cases of head imaging for minor head injury}}{\text{Number of emergency department visits for minor head injury}}$$

xiii. Neighbourhood income and place of residence (urban/rural) were derived from Statistics Canada's PCCF+.

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The patient was younger than age 18 or was age 65 or older.
- The patient had red flags that would indicate head imaging (see Table 11).
- The patient had a major trauma or a comorbidity that would indicate head imaging:
  - Had a triage score indicating they were resuscitated (Canadian Triage and Acuity Scale, Level 1);
  - Had a Glasgow Coma Scale[xiv] score less than 13, indicating moderate to severe brain injury; and/or
  - Was admitted to inpatient care or transferred to another facility.
- The patient had signs of severe trauma during an emergency department visit or hospital admission in the 12 months prior to the index visit. This included previous emergency department visits or hospital admissions with a diagnosis of injury due to certain consequences of external causes (ICD-10-CA codes S00 to T98) or external causes of injury (ICD-10-CA codes V01 to Y98). In addition, the visit must have met at least one of the criteria above for major trauma or comorbidity indicating head imaging.
- The patient had non-concussive head injuries and/or injuries due to penetrative forces. Note that this exclusion was not used when a fall was involved. This list is based on previous work associated with the WHO's Collaborating Centre for Neurotrauma Task Force on Mild Traumatic Brain Injury.[28] The ICD-10-CA codes were compiled by CIHI's classification experts (see Table 12).

Risk adjustment

In the trending and provincial variation analysis, the rate of head imaging was adjusted for patient age, sex and triage level.

xiv. The GCS is a validated tool to assess the level of consciousness in a person and an important element for evaluating the severity of head trauma.

Limitations

There is no consensus on how to clearly distinguish minor head trauma from major head trauma in administrative databases. This limits comparability with other studies. Several clinical guidelines have used the GCS as one of the indications to distinguish minor from major head trauma.[27, 29] The GCS score is mandatory in the DAD only when a patient suffers from an intracranial injury; however, a GCS score is not always provided. Because of this, the analysis was not restricted to records with a GCS score between 13 and 15. Nonetheless, GCS scores lower than 13 were excluded to remove cases of moderate to severe brain injury.

Administrative data also does not capture the clinician's decision process and may not capture a patient's full clinical history. While efforts were made to identify and exclude patients with any indication for receiving head imaging, it is possible that some patients required diagnostic imaging from a clinical perspective and that this was not reflected in the data.

Table 10 ICD-10-CA codes to identify head trauma

Definition	ICD-10-CA
Postconcussional syndrome	F07.2
Fracture of vault of skull	S02.0
Fracture of base of skull	S02.1
Fracture of orbital floor	S02.3
Multiple fractures involving skull and facial bone	S02.7
Fractures of other skull and facial bones	S02.8
Fracture of skull and facial bones, part unspecified	S02.9
Intracranial injury	S06
Crushing injury of skull	S07.1
Unspecified injury of head	S09.9
Sequelae of fracture of skull and facial bones	T90.2
Sequelae of intracranial injury	T90.5

Note
ICD-10-CA: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada*.

Table 11 Red flags for head imaging

Red flag category	ICD-10-CA/CCI codes
Obvious open skull fracture; suspected open or depressed skull fracture; any sign of basilar skull fracture (e.g., hemotympanum, raccoon eyes, Battle sign, cerebrospinal fluid otorhinorrhea)	G96.0, S02.0, S02.1, S02.7, S02.901, S06.86
Indicators of severe head trauma	F04, F05, F06, F07, F09, G40, G41, G45, G46, I60, R11, R25, R26, R27, R29, R40, R41, R42, R44, R55, R56, S02.3, S02.8, S02.9, S04.0, S04.1, S04.2, S04.4, S04.6, S04.7, S06.1, S06.2, S06.4, S06.5, S06.6, S07.8, S07.9, S08, T02.0, T04.0, T06.0, T90.2, T90.3, T90.5
Retrograde amnesia to an event lasting 30 minutes or longer after the event	R41.2
A "dangerous" mechanism (e.g., pedestrian struck by motor vehicle, occupant ejected from motor vehicle, fall from higher than 3 feet or down more than 5 stairs)	V02, V03, V04, V05, V09, V12, V13, V14, V15, V23, V24, V25, W13
Bleeding disorders	D65–D69
Coumadin use	Z92.1
Other diagnostic CT imaging indications, such as encephalitis, neoplasms	A81.1, A83, A84, A85, A86, A87, C41.0, C41.1, C47.0, C49.0, C71, C77, C78, C79, D89.1, E22, E23, E24, F44.5, F81, F89, G04, G05, G11, G43, G44.3, G50, G51, G52, G53, G91, G93, H11.4, H34.0, H34.1, H46, H47.0, H49.0, H49.1, H49.2, H53.2, H81, H93.3, I25.0, I25.1, I60–I69, I71, I72, I77.6, I79.0, R62.9, R28, R90.0, Q04.0, Q04.3, Q04.6, Q04.8, Q07.8, Q28, Z85.80, Z86.7, Z87.8
Severe interventions such as drainage of meninges and dura mater of brain, management of external appliances related to the respiratory system	1.AA.52, 1.EA.74, 1.EA.80, 1.GZ.30, 1.GZ.31, 1.GZ.38

Notes

ICD-10-CA: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada*.

CCI: *Canadian Classification of Health Interventions*.

CT: Computed tomography.

Head imaging indication codes are based on the Canadian CT Head Rule[27] for patients with minor head injury as well as on consultation with Choosing Wisely Canada clinical advisors.

Table 12 Non-concussive mild and penetrating head injury

Description	ICD-10-CA codes
Sharp objects and penetrating injuries	T15–T19, W25, W26, W32–W34, W42, W44–W46, W53–W60, X72–X75, X78, X93–X95, X99, Y22–Y24, Y28, Y35.0, Y35.4, Y36.4
Extreme temperatures or sunlight	T20–T35, W85–W99, X30–X32, X77, X98, Y27, Y36.2, Y36.3, Y36.5
Substance toxicity	T36–T78, T90–T98, X00–X29, X40–X57, X60–X71, X76, X85–X92, X97, Y06, Y07, Y10–Y21, Y26, Y35.2, Y36.6, Y36.7, W65–W84
Due to medical treatment	Y40–Y84

Note
ICD-10-CA: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada*.

Table 13 CCI codes to identify brain and cranial imaging

Type of diagnostic imaging	CCI codes
X-ray	3.AN.10, 3.AN.12, 3.EA.10, 3.EA.12
CT	3.AN.20, 3.AN.70, 3.EA.18, 3.EA.20, 3.ER.20
MRI	3.AN.40, 3.ER.40

Notes
CCI: *Canadian Classification of Health Interventions*.
CT: Computed tomography.
MRI: Magnetic resonance imaging.
Diagnostic imaging was identified from data on index visits in the National Ambulatory Care Reporting System.

Knee arthroscopy in adults age 60 and older

Recommendation

This is the recommendation of the Canadian Orthopaedic Association, the Canadian Arthroplasty Society and the Arthroscopy Association of Canada:

Don’t use arthroscopic debridement as a primary treatment in the management of osteoarthritis of the knee.[30]

Operational definition

To estimate low-value care in relation to the recommendation on knee arthroscopy, the metric in this report measured the number of knee arthroscopies in the population age 60 and older. This case definition was developed by expert advisors because, among those 60 and older, knee arthroscopy is most commonly performed for osteoarthritis or degenerative meniscal tear, despite the lack of benefit.[31] Additionally, there were challenges in precisely identifying osteoarthritis using administrative data and, therefore, an age cut-off was used as a proxy to define appropriateness.

This measure was calculated as the proportion of adults age 60 and older who had had a knee arthroscopy. For the interpretation of this measure, lower rates are favourable.

Knee arthroscopy

A knee arthroscopy is a minimally invasive surgical procedure and can be identified by the intervention codes listed in Table 14.

Methodology

Acute care and day surgery records from the DAD as well as day surgery records from NACRS were used to identify elective knee arthroscopies among adults age 60 and older. The rate of knee arthroscopies was calculated by dividing the number of knee arthroscopies by population estimates from Statistics Canada as the provincial population base.[9]

For knee arthroscopy patients, the patient profile was broken down by age, sex, neighbourhood income quintile and urban/rural residence.[xv]

Data sources

- DAD: 2014–2015 to 2020–2021
- NACRS: 2014–2015 to 2020–2021
- Statistics Canada, Table 17-10-0005-01, Population estimates on July 1st, by age and sex[9]

Calculation

$$\text{Rate of knee arthroscopy} = \frac{\text{Number of knee arthroscopies in adults age 60 and older}}{\text{Population estimates for adults age 60 and older}}$$

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The patient had a Quebec record (these were excluded because data submissions practices were not comparable with the rest of Canada);
- The patient had a “most responsible diagnosis” or a main problem of pyogenic arthritis (ICD10-CA code M00); and/or
- The patient had had an urgent hospital admission.

Age standardization

To support comparability across jurisdictions and across time, age standardization was performed using 2011 Canadian population data.

xv. Neighbourhood income and place of residence (urban/rural) were derived from Statistics Canada’s PCCF+.

Limitations

Based on recommendations from clinical experts, this measure was not specific to knee arthroscopies performed solely for primary treatment in the management of osteoarthritis of the knee. In alignment with quality assurance reporting in Manitoba and British Columbia, a broader scope was used, looking at all knee arthroscopies for adults age 60 and older.[32] Among those age 60 and older, knee arthroscopy is most commonly performed for osteoarthritis or degenerative meniscal tear, despite the lack of benefit.[31]

Results for the territories were not reported independently due to low cell counts but were included in the overall rate.

CIHI data included only the procedures funded by the provincial public health insurance programs. Knee arthroscopy procedures paid by private insurance or out of pocket were not included in this analysis.

Table 14 Intervention codes to identify knee arthroscopy

Description	CCI codes
Repair, knee joint, joint repair without meniscus involvement, no tissue used for repair, endoscopic approach	1.VG.80.DA
Repair, knee joint, with meniscectomy or meniscoplasty, no tissue used for repair, endoscopic approach	1.VG.80.FY
Excision partial, knee joint or other joint excision (e.g., arthrectomy, chondrectomy, debridement) with or without synovectomy endoscopic approach	1.VG.87.DA

Note
CCI: *Canadian Classification of Health Interventions*.

Caesarean section in low-risk deliveries

Recommendation

This is the recommendation of the Society of Obstetricians and Gynaecologists of Canada:

Don’t do a caesarean delivery for the sole indication of failure of progress in labour in the latent phase of labour for a woman at term with a singleton fetus and cephalic presentation.[33]

Operational definition

An existing indicator from CIHI’s Your Health System, Low-Risk Caesarean Sections, was used to estimate low-value care in relation to the recommendation on Caesarean delivery. Provincial-, regional- and facility-level results of this measure are published in CIHI’s Your Health System: In Depth for all provinces and territories except Quebec.

This measure was calculated as the proportion of Caesarean section (C-section) deliveries among low-risk deliveries. For the interpretation of this measure, lower rates are favourable.

Low-risk deliveries

The definition of low-risk deliveries used for this analysis was chosen to align with the pre-existing reporting in CIHI’s Your Health System: In Depth and was also based on data availability. This measure was calculated using a subset of Modified Robson Group 1 — the first group within a C-section classification system adapted for use in Canada.[34] To further specify low-risk deliveries, the analysis was limited to first-time births and excluded post-term births and circumstances with maternal and fetal health conditions and other complications of pregnancy.

Maternal and fetal characteristics

Prolonged labour and fetal distress were 2 of the characteristics explored as breakdowns in this analysis. Prolonged labour was defined as a prolonged first stage of labour more than 18 hours in first-time delivery. Fetal distress was defined as a fetal stressor complicated by a fetal heart rate anomaly, meconium in amniotic fluid or fetal asphyxia. The ICD-10-CA codes for these circumstances are found in Table 15.

Methodology

The indicator was expressed as the rate of C-sections per 100 deliveries in an acute care institution, and measured C-sections among hospitalizations where a singleton (a delivery with 1 baby), term, cephalic (head in the proper position) delivery was recorded among low-risk nulliparous women (i.e., their first birth) in spontaneous labour.

To understand variation associated with patient-level factors, breakdowns were explored by maternal age, neighbourhood income quintile, urban/rural residence,[xvi] prolonged labour and fetal distress.

Data source

- DAD: 2015–2016 to 2020–2021

Calculation

$$\text{Rate of low-risk C-sections} = \frac{\text{Number of C-sections among low-risk deliveries}}{\text{Number of low-risk deliveries}}$$

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The patient had had multiple gestations, multiple births or a stillbirth delivery.
- The patient had had a pre-term or post-term delivery (gestational age at delivery of less than 37 completed weeks or greater than 41 completed weeks).
- There was a breech presentation.
- The baby was in a transverse or oblique lie.
- The pregnancy was multiparity (not the birth of the first child) or unknown parity.
- Labour was induced (this includes the artificial rupture of membranes, the use of oxytocic agents or prostaglandins, and cervical ripening by balloon catheter or Laminaria).

xvi. Neighbourhood income and place of residence (urban/rural) were derived from Statistics Canada's PCCF+.

- A C-section was planned.
- There was a pre-existing maternal or fetal risk, including pre-existing or gestational diabetes, pre-existing or gestational hypertension, preeclampsia, eclampsia, venous complications (including deep or central venous thrombosis), liver disorder, other specified pregnancy-related conditions, complications of anesthesia during pregnancy, abnormality and damage, other fetal problems (including isoimmunization, alloimmunization, fetal asphyxia, intrauterine growth restriction and excessive fetal growth), polyhydramnios and other amniotic fluid and membrane disorders, placenta disorders, placenta previa, placental abruption, antepartum hemorrhage, rupture of uterus, obstetric embolism, herpes, HIV (human immunodeficiency virus), and other maternal disease (including morbid obesity, cancer, hematology disorders, cardiovascular disorders, musculoskeletal disorders, neurological disorders, cystic fibrosis, Crohn disease, lupus, rheumatoid arthritis and specified renal diseases)
- The patient's age was unknown.
- The record had an invalid discharge date.
- The record was for a termination of pregnancy.

Full details and codes for the exclusions can be found on CIHI's Indicators page for the indicator Low-Risk Caesarean Sections.

Risk adjustment

To support comparability across jurisdictions and across time, age adjustment using logistic regression was performed.

Limitations

Results were not calculated for Quebec since parity information was not available for this province. Results for Nunavut were not profiled independently due to low cell counts, but were included in the overall rate.

Although prolonged labour was identifiable in the data, the information on the specific rationale for C-section, such as having the sole indication of failure to progress in labour in the latent phase of labour, was not available in the data.

Table 15 ICD-10-CA codes to identify prolonged labour and fetal distress

Condition	ICD-10-CA codes
Prolonged labour	O62.0, O63.0, O63.9
Fetal distress	O68.001, O68.201, O68.301

Note
ICD-10-CA: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada*.

Red blood cell transfusion in hospitalized patients

Recommendation

This is the recommendation of the Canadian Society of Internal Medicine:

Don’t transfuse red blood cells for arbitrary hemoglobin or hematocrit thresholds in the absence of symptoms, active coronary disease, heart failure or stroke.[35]

Operational definition

This measure was reported in the 2017 report *Unnecessary Care in Canada*. In the follow-up report, CIHI revised the analysis to broaden the cohort beyond hip and knee replacement patients, assessing red blood cell transfusion rates for all obstetric, medical and surgical patients, including the hip and knee replacement surgical subgroups. This measure estimates low-value care in relation to the recommendation, taking a broad lens to inform on the reduction of low-value blood transfusions more generally. The analysis was not limited based on comorbidities or clinical thresholds, and overall rates of red blood cell transfusions in hospitalized patients were explored, adjusting the results based on patient factors, including comorbidity level.

This measure was calculated as the proportion of hospitalizations in which the patient received at least one red blood cell transfusion. For the interpretation of this measure, lower rates are favourable.

Red blood cell transfusions

Red blood cell transfusions were identified in acute in-hospital patients across Canada using either CCI codes (in Quebec) or a red blood cell transfusion indicator (see Table 16). Starting in 2014, the 5 provinces with mandatory reporting of red blood cell transfusions were New Brunswick, Quebec, Ontario, Manitoba and Saskatchewan. Note that this analysis included only non-autologous transfusions (i.e., from a donor). Autologous transfusions (one's own blood) have a much lower risk profile, while receiving donor blood has the potential for adverse reactions.

Methodology

Hospitalization records for adult patients (age 18 and older) in acute care facilities in New Brunswick, Quebec, Ontario, Manitoba and Saskatchewan were selected for inclusion. Factors included in the risk adjustment were identified from the index hospitalization record.

To understand variation associated with patient-level factors, breakdowns were explored by age, sex, neighbourhood income quintile, urban/rural residence,[xvii] patient group and hospital peer group.

Data source

- DAD-HMDB: 2014–2015 to 2020–2021

Calculation

$$\text{Red blood cell transfusion rate} = \frac{\text{Number of hospitalizations with a red blood cell transfusion}}{\text{Number of all hospitalizations}}$$

Exclusions

Records were excluded if one or more of the following circumstances was present:

- The patient was younger than age 18;
- The patient had a major clinical category of mental health; and/or
- The patient had had an autologous blood transfusion.

xvii. Neighbourhood income and place of residence (urban/rural) were derived from Statistics Canada's PCCF+.

Risk adjustment

Risk adjustment through logistic regression was performed separately in 3 models (obstetric, medical and surgical) to meaningfully compare across jurisdictions and over time. Overall adjusted rates were calculated by combining the obstetric, medical and surgical models.

Variables for the risk adjustment were

- Age
- Sex
- Severity index
- Length of hospital stay

The severity index measured indications or reasons for potentially needing a red blood cell transfusion. ICD-10-CA codes for specific indications are found in Table 17. Due to differences in the data collection of diagnoses and comorbidities in Quebec — where it was not possible to distinguish comorbidities from secondary diagnoses — a modification was required to ensure comparability with the identification of comorbidities in other provinces. Severity index score groups for Quebec patients were assigned differently to achieve comparability across Canada, as shown in Table 18. This methodology was consistent with the approach taken for other CIHI products, such as comorbid conditions used to calculate the Charlson Index score in CIHI's Hospital Standardized Mortality Ratio indicator and other clinical indicators.[36, 37]

In the analysis for red blood cell transfusion in hip and knee replacements, the following additional factors were included in the risk adjustment model:

- Anesthetic technique
- Fixation type
- Bilateral or unilateral procedure
- Primary procedure or revision

Limitations

The use of administrative data does not allow for capturing a patient's full clinical history. Therefore, it could not be definitively determined if there was an appropriate indication for red blood cell transfusions. Available indications were captured in the severity index variable used for risk adjustment. Hospitalizations with indications for red blood cell transfusion were not removed from the calculation. As a result, some red blood cell transfusions will be expected and appropriate — even though a lower rate is favourable.

Blood test data on hematocrit and hemoglobin levels or red blood cell count for patients was not available for this study. Data for other factors such as a patient's height and weight that could be relevant to the use of red blood cell transfusions was also not available for the study.

This analysis was based on the receipt of a red blood cell transfusion per hospitalization and did not consider other components or products transfused during the hospitalization. Information on the volume or number of units transfused was not available for the study.

Table 16 Identification of red blood cell transfusions

Criteria	Definition
Red blood cell transfusion indicator	In the DAD: Indicates whether the patient received a blood transfusion using red blood cells
CCI code present*	1.LZ.19.HM-U1, 1.LZ.19.HM-U9, 1.LZ.19.HH-U1-J, 1.LZ.19.HH-U9-J

Notes

* Canadian Classification of Health Interventions was used to capture transfusions in Quebec only, as Quebec hospitals do not submit a blood transfusion indicator. Transfusions are mandatory to code for Quebec inpatients.

DAD: Discharge Abstract Database.

CCI: *Canadian Classification of Health Interventions*.

Table 17 Indications for red blood cell transfusion and severity index weighting

Condition	Severity index weighting	ICD-10-CA codes (includes all diagnosis types)
Anemia	3	D50, D52–D53, D55–D64, D70–D77, E86.8
Hemorrhage	2	D65, D66, D67, D68, D69, E27.4, I51.8, I60, I61, I62, I85.0, I98.3, J95.00, K22.8, K25.0, K25.2, K25.4, K25.6, K26.0, K26.2, K26.4, K26.6, K27.0, K27.2, K27.4, K27.6, K28.0, K28.2, K28.4, K28.6, K29.0, K31.80, K55.20, K62.5, K63.80, K64, K66.1, K91.40, K91.43, K91.60, K92, N32.8, N50.8, N85.7, N93, N95.0, N99.50, R04, R31, R57.1, R58, T81.0
Heart failure and pulmonary edema	1	I50, J81
Ischemic heart disease	1	I20, I21, I22, I24, I25
Cerebrovascular diseases	1	I63–I67, I69
Renal failure	1	N17, N18, N19, N99.0, N08.3
Cancer	1	C00–C06, C09–C16, C18–C26, C30, C38, C53, C55, C56, C61, C64–C68, C81–C86, C88, C90–C96
Trauma	1	S00–T35 (excluding S13 and S33), T79–T88 (excluding T81.0), T90–T98

Notes
ICD-10-CA: *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada*.
The total value of the severity score was equal to the sum of weights on each abstract. For example, if an abstract had both anemia and cerebrovascular disease, then the total value would be 3 + 1 = 4.

Table 18 Severity index groupings

Severity index group	Severity score for Canada (excluding Quebec)	Severity score for Quebec
Non-severe	0	0 or 1
Moderately severe	1 or 2	2, 3 or 4
Very severe	3+	5+

Preoperative tests for low-risk surgery

Recommendation

This is the recommendation of the Canadian Society of Internal Medicine:

Don’t routinely perform preoperative testing (such as chest X-rays, echocardiograms, or cardiac stress tests) for patients undergoing low risk surgeries.[35]

The Canadian Anesthesiologists’ Society and the Canadian Cardiovascular Society have similar recommendations.[38, 39]

Operational definition

This measure was reported in the 2017 report *Unnecessary Care in Canada* using data from Saskatchewan and Alberta, and building upon research from Kirkham et al. (2015) in Ontario.[40] In the follow-up report, CIHI applied the same methodology but expanded the analysis to include data from Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia, based on the availability of billing data in those jurisdictions.

This measure was calculated as the proportion of low-risk procedures in which the patient received preoperative cardiac testing. For the interpretation of this measure, lower rates are favourable.

Low-risk procedures

Low-risk procedures included those with low cardiac risk,[40] and they fell into 3 general categories: endoscopy, ophthalmology and other procedures (e.g., selected orthopedic and urological procedures; see Table 19 for a full list of CCI codes). To further ensure procedures were low risk, 2 additional criteria were applied:

- Only procedures performed on the same day as admission to acute care or performed in an ambulatory care setting were included. This excluded procedures performed as a result of or related to treatment in acute care.
- Only the principal intervention code (in the DAD) or first-listed intervention (in NACRS) was used to identify the low-risk procedure. This ensured that the low-risk procedure was the primary (or only) reason a patient was admitted for care.

Preoperative cardiac testing

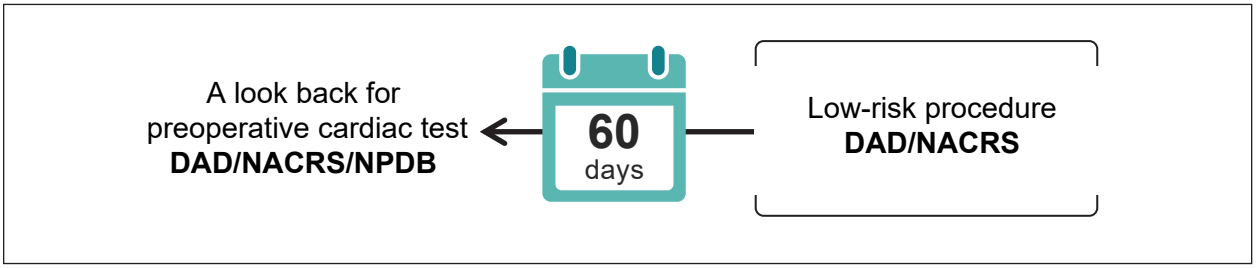
A number of specialist groups listed a variety of preoperative tests as having low value, from laboratory tests to X-rays.[3, 35, 38, 41, 42] This analysis was restricted to preoperative cardiac testing, in alignment with the CWC recommendation from the Canadian Society of Internal Medicine.[35] Preoperative cardiac testing was defined as having an electrocardiogram (ECG), cardiac stress test, echocardiogram or chest X-ray in the 60 days prior to a low-risk procedure (see Table 20 for cardiac testing codes).

Preoperative testing can occur in a number of health care settings. Consequently, multiple databases were used to identify these tests. Tests done in the community were identified in the NPDB, whereas tests done in hospital were identified in the DAD or in NACRS and may or may not have also been in the NPDB (depending on the funding model), resulting in duplicate reporting. If cases were captured in more than one database, only 1 test was included.

Methodology

All analysis was based on low-risk procedures occurring between 2015–2016 and 2020–2021. For each low-risk procedure, a retrospective search was performed to identify cardiac testing in the previous 60 days.

Figure 4 Identifying cardiac testing for low-risk surgeries in the 60 days prior, 2015–2016 to 2020–2021



Notes
DAD: Discharge Abstract Database.
NACRS: National Ambulatory Care Reporting System.
NPDB: National Physician Database.

To understand variation across patient-level factors, breakdowns were explored by surgery type, age, sex, neighbourhood income quintile and urban/rural residence.[xviii]

Data source

- DAD: 2014–2015 to 2020–2021
- NACRS: 2014–2015 to 2020–2021
- NPDB: 2014–2015 to 2020–2021

Calculation

$$\text{Rate of preoperative testing} = \frac{\text{Number of low-risk procedures with at least one preoperative test}}{\text{Number of low-risk procedures}}$$

xviii. Neighbourhood income and place of residence (urban/rural) were derived from Statistics Canada's PCCF+.

Exclusions

Records were excluded if one or more of the following circumstances was present:

- Records had an invalid health care number;
- The sex of the patient was other than male or female;
- Duplicate procedures were found, based on health care number and issuing province, date and procedure type;
- The patient was younger than age 18;
- The patient had had the low-risk procedure performed after their first day of admission to acute inpatient care;
- Preoperative testing had been performed on the patient on the same day as surgery; and/or
- The patient had had a procedure in a facility where fewer than 50 low-risk procedures had been performed.

Risk adjustment

To support comparability across jurisdictions and across time, risk adjustment using logistic regression was performed, applying the variables of age, sex and surgery type.

Limitations

Comparison between jurisdictions for analysis using billing data should be done with care, due to differences in fee service codes, the identification of facility location, and provincial and territorial funding models. Codes for this analysis were selected to facilitate cross-provincial comparisons. The reasons for the cardiac test were not available in the data; therefore, the assumption was made that these were preoperative tests.

Table 19 Low-risk procedure codes

Category	Specific procedure	CCI code
Endoscopy	Esophagus/stomach	2.NA.70.BA, 2.NA.71.BA, 2.NA.71.BR, 2.NF.70.BA, 2.NF.71.BA, 2.NF.71.BP, 2.NF.71.BR
	Large bowel	2.NM.70.BA, 2.NM.71.BA, 2.NM.71.BR
Ophthalmology	Other ophthalmology	1.CC, 1.CD, 1.CE, 1.CF, 1.CG, 1.CH, 1.CJ, 1.CL, 1.CM, 1.CN, 1.CP, 1.CQ, 1.CR, 1.CS, 1.CT, 1.CU, 1.CV, 1.CX, 1.CZ
	Secondary cataract	1.CL.59
	Cataract	1.CL.89
Other	Orthopedic: Shoulder (endoscopic drainage/ extraction/procurement/release)	1.TA.52.DA, 1.TA.58.DA, 1.TA.72.DA, 1.TA.80.DA, 1.TA.80.GZ
	Orthopedic: Clavicle (endoscopic drainage/ distal resection)	1.TB.52.GB, 1.TB.52.GD, 1.TB.87.DA
	Orthopedic: Rotator cuff (endoscopic extraction/release/repair)	1.TC.57.DA, 1.TC.59.DA, 1.TC.72.DA, 1.TC.80.DA, 1.TC.80.GC
	Orthopedic: Arm/forearm (nerve decompression/repair/excision)	1.BM.72, 1.BM.80, 1.BM.87, 1.BN.72
	Orthopedic: Wrist/hand	1.UB.52, 1.UB.53, 1.UB.55, 1.UB.57, 1.UB.58, 1.UB.72, 1.UB.73, 1.UB.74, 1.UB.75, 1.UB.80, 1.UB.87, 1.UC.53, 1.UC.55, 1.UC.57, 1.UC.72, 1.UC.73, 1.UC.74, 1.UC.75, 1.UC.79, 1.UC.80, 1.UC.82, 1.UC.87, 1.UC.89, 1.UF.55, 1.UF.73, 1.UF.74, 1.UF.80, 1.UF.87, 1.UG.52, 1.UG.53, 1.UG.55, 1.UG.57, 1.UG.72, 1.UG.73, 1.UG.74, 1.UG.75, 1.UG.80, 1.UG.87, 1.UJ.71, 1.UJ.73, 1.UJ.74, 1.UJ.75, 1.UJ.82, 1.UJ.87, 1.UJ.93, 1.UK.53, 1.UK.55, 1.UK.72, 1.UK.73, 1.UK.74, 1.UK.75, 1.UK.80, 1.UK.87, 1.UK.93, 1.US.58, 1.US.72, 1.US.80, 1.UT.53, 1.UT.55, 1.UT.72, 1.UT.80, 1.UT.84, 1.UU.53, 1.UU.55, 1.UU.72, 1.UU.80, 1.UU.84, 1.UV.72, 1.UV.80, 1.UY.52, 1.UY.55, 1.UY.56, 1.UY.57, 1.UY.59, 1.UY.72, 1.UY.80, 1.UY.87
	Orthopedic: Nerve	1.BP.72, 1.BP.80, 1.BP.87, 1.BQ.72, 1.BQ.80, 1.BQ.87
	Orthopedic: Hip arthroscopy (extraction/ procurement/release/partial excision)	1.VA.58.DA, 1.VA.72.DA, 1.VA.87.DA, 1.VA.87.GB
	Orthopedic: Knee arthroscopy (drainage/ extraction/procurement/release/ partial excision)	1.VG.52.DA, 1.VG.58.DA, 1.VG.72.DA, 1.VG.87.DA, 1.VG.87.GB

Category	Specific procedure	CCI code
Other	Orthopedic: Knee meniscus (endoscopic repair/partial or total excision)	1.VK.80.DA, 1.VK.87.DA, 1.VK.89.DA
	Orthopedic: Knee ligament (anterior cruciate ligament) (endoscopic repair/partial excision)	1.VL.80.DA, 1.VL.80.FY, 1.VL.87.DA, 1.VL.87.GB
	Orthopedic: Knee ankle/foot arthroscopy (extraction/procurement/release)	1.WA.58.DA, 1.WA.72.DA
	Orthopedic: Excision partial, intervertebral disc	1.SE.87
	Urologic: Bladder neck suspension	1.PL.74
	Urologic: Transurethral partial excision	1.PL.87
	Urologic: Bladder drainage	1.PM.52, 1.PM.54
	Urologic: Destruction, bladder	1.PM.59
	Urologic: Prostate resection (transurethral resection of the prostate)	1.QT.87
	Urologic: Urethra	1.PQ.26, 1.PQ.35, 1.PQ.50, 1.PQ.52, 1.PQ.53, 1.PQ.54, 1.PQ.55, 1.PQ.57, 1.PQ.58, 1.PQ.59, 1.PQ.72, 1.PQ.77, 1.PQ.78, 1.PQ.80
	Gynecologic: Hysteroscopy (endometrial ablation)	1.RM.59.BA
	Gynecologic: Laparoscopy (oophorectomy, cystectomy)	1.RB.52.BA, 1.RB.52.DA, 1.RB.56.DA, 1.RB.74.DA, 1.RB.87.DA, 1.RB.89.DA, 1.RD.52.BA, 1.RD.89.DA
	Hernia repair (repair muscles of chest and abdomen)	1.SY.80
	Inguinal lymph nodes	1.MJ.52, 1.MJ.87, 1.MJ.89
	Peripheral lymph nodes	1.MK.52, 1.MK.87, 1.MK.89
	Breast (removal of device/fixation/size reduction/size increase/repair/partial or total excision)	1.YM.55, 1.YM.74, 1.YM.78, 1.YM.79, 1.YM.80, 1.YM.87, 1.YM.89
	Laparoscopic cholecystectomy	1.OD.57

Note
CCI: Canadian Classification of Health Interventions.

Table 20 CCI and billing codes identifying cardiac testing

Database	ECG	Echocardiogram	Stress test	Chest X-ray
DAD/NACRS (CCI codes)	2.HZ.24	3.IP.30	2.HZ.08	3.IK.10, 3.IM.10, 3.IN.10, 3.IP.10, 3.IS.10
Nova Scotia NPDB	I1168, 03.52, 03.52A	I1310, I1311, I1312, I1313, R1312, R1313	03.43, 03.41A, 03.41B, 03.44A, 03.44B, R1904, R1905, R1906 R1907, R3904, R3905, R3906, R3907, R5904, R5905, R5906, R5907	R404, R405, R3404, R5404, R3405, R5405
Ontario NPDB	G310, G313	G560, G561, G562, G566, G567, G568, G570, G571, G572, G574, G575, G576, G577, G578, G581	G111, G112, G174, G315, G319, G582, G583, G584, J607, J608, J609, J666, J807, J808, J809, J866, J900, J901	X090, X091, X092, X195
Manitoba NPDB	9836, 9837, 9838	9730, 9736, 9741, 9743	9732, 9830, 9831, 9832, 9953, 9954, 9955, 9957, 9958, 9959	7024, 7025, 7026, 7027, 7032
Saskatchewan NPDB	030D, 031D, 032D	020W, 320A, 321A, 322A, 323A, 324A, 520A, 521A, 522A, 523A, 530A, 531A, 532A, 533A, 534A, 556A, 557A	062D, 063D, 064D, 065D, 066D, 067D	150X, 158X, 159X
Alberta NPDB	03.52A, 03.52B	X306, X306A, X306B, X307	X170, X171, X172, X173, 03.41A, 03.41B, 03.41C, 03.41D, 03.44A	X 20, X 20A, X 20B, X 21
British Columbia NPDB	0000117, 0000527, 0000528, 0000529, 0000532, 0000533, 0000534, 0033016, 0033017, 0033018, 0093120	0008638, 0008679, 0033057, 0033091, 0033093, 0033094	0000530, 0000531, 0000535, 0001730, 0001731, 0001732, 0008662, 0033034, 0033035, 0033036, 0095062, 0095063	0000729, 0008550, 0008553

Notes
ECG: Electrocardiogram.
DAD: Discharge Abstract Database.
NACRS: National Ambulatory Care Reporting System.
CCI: *Canadian Classification of Health Interventions*.
NPDB: National Physician Database.

Appendix

Text alternative

Figure 1: Identifying lower-back imaging 6 months after index family physician visit for lower-back pain, 2015–2016 to 2020–2021

A 6-month follow-up was used to identify lower-back imaging, including X-rays, CT scans and MRIs from NACRS and the NPDB, following the index (initial) family physician visit for lower-back pain from the NPDB. A 12-month lookback period was used to identify red flags and persistent lower-back pain from the NPDB, NACRS and the DAD prior to the index family physician visit.

Notes
NACRS: National Ambulatory Care Reporting System.
NPDB: National Physician Database.
DAD: Discharge Abstract Database.
CT: Computed tomography
MRI: Magnetic resonance imaging.

Calculation for rate of lower-back pain imaging

Rate of lower-back pain imaging equals the number of patients with at least one diagnostic image of the back divided by the number of patients with lower-back pain.

Figure 2: Survey of Pap test within last 3 years among women age 18 to 24, (2008, 2012 and 2017)

In the index year for the survey (the date the survey was administered), respondents were asked survey questions inquiring about screening for cervical cancer in the 3 years prior.

Calculation for rate of Pap tests among women age 18 to 24

Rate of Pap tests among women age 18 to 24 equals the number of respondents reporting that they are a woman age 18 to 24 who had had a Pap test in the past 3 years divided by the number of respondents reporting that they are a woman age 18 to 24.

Calculation for total volume of antibiotics for systemic use

Total volume of antibiotics for systemic use equals the total number of defined daily doses of systemic antibiotics divided by the population, multiplied by 1,000, divided by 365.

Calculation for rate of chronic benzodiazepine or other sedative–hypnotic use

Rate of chronic use equals the total number of older adults with chronic benzodiazepine or other sedative–hypnotic use divided by the total number of older adults with at least one claim in the public drug program.

Calculation for percentage of long-term care residents in daily physical restraints

Percentage of long-term care residents in daily physical restraints equals the number of assessments indicating daily physical restraints divided by the total number of eligible assessments.

Calculation for percentage of long-term care residents with potential inappropriate use of antipsychotics

Percentage of long-term care residents with potential inappropriate use of antipsychotics equals the number of assessments indicating inappropriate antipsychotics divided by the total number of eligible assessments.

Calculation for rate of chest X-rays for asthma

Rate of chest X-rays for asthma equals the number of emergency visits for patients with asthma who had a chest X-ray divided by the number of emergency visits for patients with asthma.

Calculation for rate of chest X-rays for bronchiolitis

Rate of chest X-rays for bronchiolitis equals the number of emergency visits for patients with bronchiolitis who had a chest X-ray divided by the number of emergency visits for patients with bronchiolitis.

Figure 3: Head imaging for minor head trauma in adults with unplanned emergency department visits, 2014–2015 to 2020–2021

Starting from the index (initial) emergency department visit for minor head injury in NACRS, a 12-month lookback period was used to identify signs of previous severe trauma in NACRS and the DAD.

Notes
NACRS: National Ambulatory Care Reporting System.
DAD: Discharge Abstract Database.

Calculation for rate of head imaging for minor trauma

Rate of head imaging for minor trauma equals the number of cases of head imaging for minor head injury divided by the number of emergency department visits for minor head injury.

Calculation for rate of knee arthroscopy

Rate of knee arthroscopy equals the number of knee arthroscopies in adults age 60 and older divided by the population estimates for adults age 60 and older.

Calculation for rate of low-risk C-sections

Rate of low-risk C-sections equals the number of C-sections among low-risk deliveries divided by the number of low-risk deliveries.

Calculation for red blood cell transfusion rate

Red blood cell transfusion rate equals the number of hospitalizations with a red blood cell transfusion divided by the number of all hospitalizations.

Figure 4: Identifying cardiac testing low-risk surgeries in the 60 days prior, 2015–2016 to 2020–2021

Starting from the index (initial) low-risk procedure in the DAD or NACRS, a 60-day lookback period was used to identify prior preoperative cardiac tests in the DAD, NACRS and the NPDB.

Notes
DAD: Discharge Abstract Database.
NACRS: National Ambulatory Care Reporting System.
NPDB: National Physician Database.

Calculation for rate of preoperative testing

Rate of preoperative testing equals the number of low-risk procedures with at least one preoperative test divided by the number of low-risk procedures.

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choosingwiselycanada.org
info@choosingwiselycanada.org

Canadian Institute for Health Information
Institut canadien d'information sur la santé

cihi.ca
media@cihi.ca

19387-1022