

Trends in hospital use for mechanical neck and back problems in Ontario and the United States: discretionary care in different health care systems



Evidence

Études

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Abstract

Objective: To describe and compare trends in hospital admission rates for mechanical neck and back problems between 1982 and 1992 in Ontario and the United States.

Design: A descriptive analysis of hospital admissions, with data for Ontario extracted from the Canadian Institute for Health Information database and data for the US extracted from the National Hospital Discharge Survey.

Setting: All acute care hospitals in Ontario and a probability sample of acute care hospitals in the US.

Patients: Adults aged 20 years or more who were admitted to an acute care hospital for mechanical neck or back problems in 1982, 1987 or 1992. Mechanical neck and back problems were defined using an algorithm developed by the study team.

Outcome measure: Hospital admission rate per 100 000 adults.

Results: Between 1982 and 1992 the hospital admission rate for medically treated cases decreased by 52% in Ontario and by 75% in the US. Over the same period the admission rate for surgically treated cases increased by 14% and by 35% respectively. By 1992 the admission rate for medically treated cases in the US was 23% higher than that in Ontario, whereas the rate for surgically treated cases was 164% higher.

Conclusions: The hospital-based medical or surgical treatment of mechanical neck and back problems provides an example of discretionary care. The higher admission rates for surgery in the US may reflect a larger supply of surgical specialists and imaging units. Further work is needed to confirm these findings for other types of discretionary care and to compare the appropriateness of care and clinical outcomes for discretionary care in these 2 jurisdictions.

Résumé

Objectif : Décrire et comparer les tendances des taux d'hospitalisation pour problèmes de nature mécanique au cou et au dos entre 1982 et 1992, en Ontario et aux États-Unis.

Conception : Analyse descriptive des hospitalisations, les données portant sur l'Ontario étant extraites de la base de données de l'Institut canadien de l'information sur la santé et les données sur les États-Unis provenant du National Hospital Discharge Survey.

Contexte : Tous les hôpitaux de soins actifs de l'Ontario et échantillon aléatoire d'hôpitaux de soins actifs aux États-Unis.

Patients : Adultes âgés de 20 ans ou plus admis à un hôpital de soins actifs pour des problèmes de nature mécanique au cou ou au dos en 1982, 1987 ou 1992.

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‡ See related articles pages 61 and 63

On a défini les problèmes de nature mécanique au cou et au dos au moyen d'un algorithme mis au point par l'équipe d'étude.

Mesure de résultats : Taux d'hospitalisation pour 100 000 adultes.

Résultats : Entre 1982 et 1992, le taux d'hospitalisation des cas traités médicalement a diminué de 52 % en Ontario et de 75 % aux États-Unis. Au cours de la même période, le taux d'hospitalisation des cas traités chirurgicalement a augmenté de 14 % et de 35 % respectivement. En 1992, le taux d'hospitalisation des cas traités médicalement aux États-Unis dépassait de 23 % celui de l'Ontario, tandis que le taux des cas traités chirurgicalement le dépassait de 164 %.

Conclusions : Le traitement médical ou chirurgical à l'hôpital des problèmes de nature mécanique au cou et au dos donne un exemple de soins discrétionnaires. Les taux plus élevés d'admission pour une intervention chirurgicale aux États-Unis peuvent être attribuables au fait qu'il y a plus de spécialistes en chirurgie et de services d'imagerie. Il faut pousser les recherches afin de confirmer ces résultats pour d'autres types de soins discrétionnaires et comparer la pertinence des soins et des résultats cliniques dans le cas des soins discrétionnaires dans ces deux juridictions.

The Canadian and US health care systems are frequently compared, both anecdotally and systematically, to provide insights into broad trends that transcend national boundaries and trade-offs that characterize individual systems. Previous comparisons of these 2 health care systems and specifically of hospital-based care have focused on 4 main areas: patterns of care for one or more clinical categories or procedure types,¹ expenditures on care,² health outcomes after care³ and access to care by socioeconomic status.⁴

To our knowledge, a comparison of discretionary hospital-based care in these 2 countries has never been carried out. By "discretionary" we mean that professional judgement plays an important role in the decision to admit or operate because controversy exists concerning optimal medical and surgical management. Compared with nondiscretionary care, discretionary care may be more profoundly influenced by the incentives, mix of physicians and supply of medical technologies in a health care system. Differences in discretionary hospital use between Boston and New Haven, Conn., for example, have been related to the supply of physicians and hospital beds.⁵

The hospital-based treatment of mechanical neck and back problems provides a particularly interesting example of discretionary care. There is controversy regarding the appropriate medical and surgical management of these problems,⁶ in that many patients may be treated outside hospital, admitted to hospital for medical treatment or admitted to hospital for surgical treatment. Hospital admission rates for these common problems have been found to vary a great deal across areas.⁷⁻⁹ The incentives to admit or operate on patients with mechanical neck and back problems differ between Canada and the US and by age group within the US. Also, the mix of physicians who

make such decisions (e.g., orthopedic surgeons and neurosurgeons) and the supply of imaging units that they use (i.e., CT and MRI scanners) differ between the 2 countries.

We examined patterns of care for mechanical neck and back problems between 1982 and 1992 in Ontario and the US to determine the magnitude of and trends in differences in the management of these common problems. We were particularly interested in whether any changes in overall patterns of care were driven primarily by changes in specific medical or surgical treatments, or whether they reflected a more general change in practice. We were also interested in whether there was convergence or divergence over time in the medical and surgical treatment of these problems in the 2 jurisdictions. To provide contextual information, we also examined health care expenditures as a proportion of the gross domestic product, the mix of physicians and the supply of imaging units in Ontario and the US in 1982 and 1992.

Methods

Data sources

Hospital discharge data were drawn from existing administrative databases. The Canadian Institute for Health Information database includes data on all hospital discharges in Ontario. The National Hospital Discharge Survey (NHDS) includes data on a random sample of hospital discharges from a probability sample (roughly 0.6%) of hospitals in the US. Civilian population estimates by 5-year age group and sex were obtained for Ontario from Statistics Canada (unpublished data) and for the US from the US Bureau of the Census.¹⁰



Inclusion criteria and algorithm

For inclusion in the analysis, a patient must have been a resident of the jurisdiction under study, been aged 20 years or more, been discharged from an acute care hospital in fiscal year 1982, 1987 or 1992 for Ontario or calendar year 1982, 1987 or 1992 for the US, and had mechanical neck or back problems as defined by an algorithm developed by the study team. The algorithm is based on the ninth revision of the *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death* (ICD-9)¹¹ and excludes nonmechanical causes, such as malignant disease, infection, pregnancy, inflammatory spondylopathy, dislocation and spinal fracture.

The Ontario database uses ICD-9 diagnosis codes with only 4 digits, 1 digit less than the ICD-9-CM¹² codes used in the NHDS database. Because the fifth digit of the diagnosis codes often indicates anatomic location (e.g., cervical or lumbar spine), we were unable to focus our analysis on only one part of the spine and instead selected diagnosis codes for both the neck and back. We drew on a previously published algorithm for the identification of admissions for mechanical low-back problems¹³ and a similar algorithm for the identification of admissions for cervical spine surgery.¹⁴ Also, the Ontario database uses the surgical codes of the *Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures*,¹⁵ not ICD-9-CM procedure codes (as used in the NHDS database), so codes were matched as closely as possible.

The algorithm allowed 3 levels of analysis: all mechanical neck and back problems, regardless of treatment approach; medically treated cases and surgically treated cases, each separately; and diagnostic categories for medically treated cases and procedure types for surgically treated cases, each separately. The diagnosis and procedure codes used for case selection are summarized in Appendix 1.

Medically treated cases required a relevant diagnosis code listed as the principal diagnosis, and surgically treated cases required both a relevant procedure code listed in the first 3 procedure fields and a relevant diagnosis code in any of the first 5 diagnosis fields. The 6 clinically relevant diagnostic categories included herniated disc, degenerative changes, spinal stenosis, possible instability, nonspecific neck or back pain, and other neck- and back-related diagnoses (e.g., postlaminectomy syndrome). Surgical procedure types included spinal fusion (with or without other procedures), and laminectomy or discectomy without fusion. Spinal fusion operations were considered separately because of evidence that fusion operations are associated with higher costs and higher complication rates than other types of back surgery.^{16,17} Discectomy and laminectomy were considered together because our previous experience suggested that the terms

are used somewhat interchangeably when coding for administrative databases.

Measure of hospital use

The annual hospital admission rate per 100 000 adults was the annual number of discharges in the relevant category divided by the eligible population, multiplied by 100 000 and directly standardized for age and sex to the 1990 US population using 5-year age and sex groupings.

Contextual information

Data on health care expenditures as a proportion of the gross domestic product and the mix of physicians were obtained from both unpublished and published sources. Health care expenditure data for Ontario and the US were obtained from the National Health Expenditures database, Canadian Institute for Health Information. The number of active physicians in Ontario by clinical category was obtained from the Ontario Physician Human Resource Data Centre, Hamilton, Ont. (Kathleen Clements and Neil Johnston: personal communication, 1996); estimates for the US were based on data from the American Medical Association.^{18,19} Primary care physicians include general practitioners and family physicians in Ontario and include general practitioners, family physicians and internists in the US.

Estimates of the supply of imaging units were also obtained from both unpublished and published sources. Estimates for Ontario for 1982 were based on information from Siemens Electric Limited, Mississauga, Ont. (Roger Fayle, Medical Systems Division: personal communication, 1996); estimates for the US for 1982 were based on data from 2 published sources.^{20,21} Estimates for Ontario and the US for 1992 were based on information from the Canadian Coordinating Office of Health Technology Assessment;²² estimates for the US were lower-range estimates.

Results

Between 1982 and 1992 the hospital admission rate for neck and back problems declined more rapidly than the rate for all conditions taken together (Table 1). These selective reductions were larger for the US than for Ontario. The ratio of medical-to-surgical hospital admissions for neck and back problems decreased in the 2 jurisdictions, although more dramatically in the US (from 3.7 to 0.7) than in Ontario (3.4 to 1.4). The decrease in the admission rate for neck and back problems and in the ratio of medical-to-surgical admissions was driven by a dramatic decline in the admission rate for medically treated cases. The admission rate for neck and back surgery in-



creased in both Ontario and the US, especially among people aged 65 years or more.

The decrease in admission rates for medically treated cases was consistent across all categories, except for spinal stenosis (Table 2). The largest declines were for degenerative changes, herniated discs and the catchall category "all other diagnoses" in Ontario and for "all other diagnoses" and degenerative changes in the US. The admission rates in the US for medically treated cases were consistently higher than those in Ontario but grew closer to those in Ontario over time (Fig. 1).

The increase in admission rates for neck and back surgery in both Ontario and the US resulted from increases in both spinal fusion and nonfusion operations, although rates for surgery not involving fusion declined slightly in the US between 1987 and 1992 (Table 3). In both jurisdictions the largest increases in admission rates for neck and back surgery occurred among older adults, particularly those undergoing spinal fusion surgery. The admission rates in the US for neck and back surgery were consistently higher than those in Ontario (Fig. 2) and grew at a faster rate than those in Ontario (Table 3). The rate of admission

for spinal fusion surgery in the US increased more than 2.5-fold over the study period and increased more than 5-fold among people aged 65 years or more.

Ontario and the US had a very different mix of physicians and supply of imaging units in 1982, and these differences increased over time (Table 4). In 1982 the US had more than twice as many orthopedic surgeons and neurosurgeons per million adults as Ontario. As well, it had more than 3 times as many CT machines as Ontario and by 1992 had more than 6 times as many MRI machines.

Discussion

The 2 broad trends that we identified in the management of mechanical neck and back problems in Ontario and the US — declines in hospital admission rates for medically treated cases and increases for surgically treated cases — were complemented by patterns of change unique to either health care system or to an age group within a system. The decline in admission rates for medically treated cases was especially pronounced among pa-

Table 1: Number of hospital admissions per 100 000 adults for mechanical neck and back problems in 1982, 1987 and 1992 in Ontario and the United States

Variable; age, yr	1982		1987 (as % of 1982)		1992 (as % of 1982)	
	Ontario	US	Ontario	US	Ontario	US
Neck and back conditions						
<i>Medically treated</i>						
20–64	231.8	579.2	164.6 (71.0)	388.9 (67.1)	101.1 (43.6)	127.1 (21.9)
≥ 65	294.1	619.8	253.6 (86.2)	358.8 (57.9)	192.1 (65.3)	221.8 (35.8)
All	242.8	586.3	180.2 (74.2)	383.6 (65.4)	117.1 (48.2)	143.7 (24.5)
<i>Surgically treated</i>						
20–64	77.3	172.8	73.2 (94.7)	196.2 (113.5)	83.6 (108.2)	213.2 (123.4)
≥ 65	47.8	102.5	68.4 (143.1)	184.2 (179.7)	76.3 (159.6)	235.8 (230.0)
All	72.1	160.5	72.4 (100.4)	194.1 (120.9)	82.3 (114.1)	217.2 (135.3)
<i>Total</i>						
20–64	309.1	752.0	237.8 (76.9)	585.2 (77.8)	184.7 (59.8)	340.3 (45.2)
≥ 65	341.9	722.3	322.0 (94.2)	542.9 (75.2)	268.3 (78.5)	457.6 (63.4)
All	314.9	746.8	252.6 (80.2)	577.7 (77.4)	199.4 (63.3)	360.9 (48.3)
All conditions						
20–64	13 538.6	16 285.1	11 981.4 (88.5)	12 939.6 (79.4)	10 305.5 (76.1)	10 969.6 (67.4)
≥ 65	34 255.5	40 272.3	33 915.0 (99.0)	35 223.0 (87.5)	30 075.8 (87.8)	33 390.2 (82.9)
All	16 797.3	20 497.4	15 431.5 (91.9)	16 852.7 (82.2)	13 415.3 (79.9)	14 906.8 (72.7)

Table 2: Number of hospital admissions per 100 000 adults for medically treated neck and back problems in Ontario and the US, by diagnosis

Diagnosis	1982		1987 (as % of 1982)		1992 (as % of 1982)	
	Ontario	US	Ontario	US	Ontario	US
Herniated disc	61.2	100.2	36.7 (60.0)	95.0 (94.8)	25.4 (41.5)	35.8 (35.7)
Degenerative changes	67.6	120.0	41.3 (61.1)	72.4 (60.3)	24.7 (36.5)	26.8 (22.3)
Spinal stenosis	7.6	8.4	9.4 (123.7)	16.3 (194.0)	9.3 (122.4)	10.7 (127.4)
Possible instability	5.5	34.1	6.1 (110.9)	28.5 (83.6)	4.3 (78.2)	11.5 (33.7)
Pain syndrome	66.8	106.4	58.9 (88.2)	68.6 (64.5)	37.7 (56.4)	26.8 (25.2)
All other diagnoses	34.1	217.3	27.8 (81.5)	103.0 (47.4)	15.6 (45.7)	32.1 (14.8)



tients in the US who were less than 65 years of age. The increase in rates for surgically treated cases was especially large for spinal fusion among patients aged 65 or more.

One of the 2 broad trends likely represents an improved use of resources, the other probably not. The decline in hospital admission rates for medically treated cases likely reflects physicians' willingness to admit fewer patients for diagnostic tests such as CT and MRI that can be done as an outpatient procedure^{23,24} and their awareness of studies published between 1982 and 1992 suggesting that 2 common forms of inpatient medical treatment, bed rest and traction, are ineffective.²⁵⁻²⁷ The increase in admission rates for spinal fusion surgery (which accounted for most of the increase in surgery overall) occurred despite the greater resource use associated with the procedure compared with available alternatives¹⁶ and the lack of supporting evidence for the effectiveness of spinal fusion for many common indications.^{28,29}

The unique patterns of change in the medical treat-

ment of mechanical neck and back problems suggest that a health care system's incentives may have an effect. The more rapid decline in hospital admission rates among US patients under 65 years of age who received medical treatment than among corresponding Ontario patients may reflect the broader range of patient and physician incentives for reduced use that were in place for the US group. Evidence from New York and Washington State suggests that much of the decline in admission rates for medically treated cases is related to the introduction of utilization review by major insurers.^{24,30}

Changes in the surgical treatment of mechanical neck and back problems suggest that the mix of physicians and supply of imaging units used by them may also have an effect. The reasons for the larger increase in hospital admission rates for surgically treated cases in the US than in Ontario may reflect increases in the US in both the supply of physicians who perform neck and back surgery (particularly spinal fusion) and the supply of CT and MRI units.

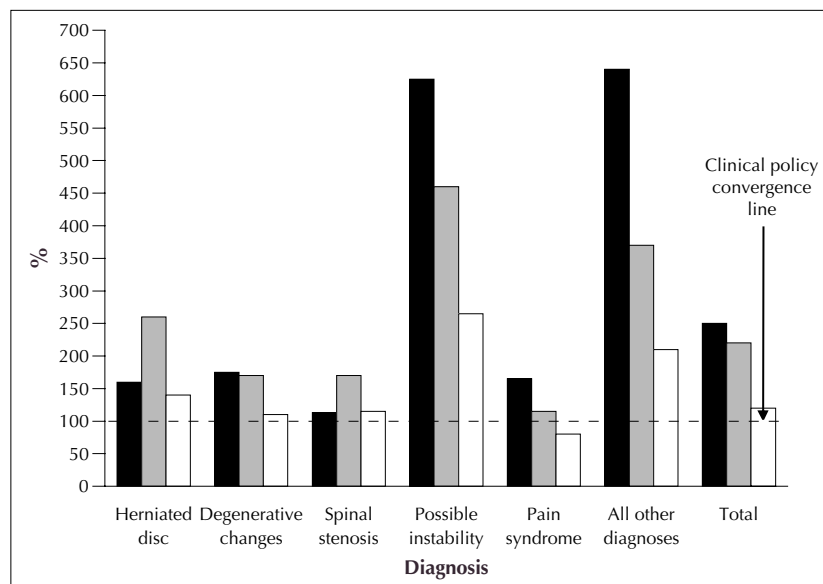


Fig. 1: Hospital admission rates in the United States, expressed as proportion of admission rates in Ontario, for medically treated neck and back problems, by diagnosis. Black bars = 1982, grey bars = 1987, white bars = 1992.

Table 3: Number of hospital admissions per 100 000 adults for surgically treated neck and back problems in Ontario and the US, by type of surgery and age

Type of surgery; age, yr	1982		1987 (as % of 1982)		1992 (as % of 1982)	
	Ontario	US	Ontario	US	Ontario	US
<i>Spinal fusion</i>						
20-64	21.6	31.0	16.6 (76.8)	46.1 (148.7)	20.7 (95.8)	73.7 (237.7)
≥ 65	8.0	8.9	10.8 (135.0)	21.2 (238.2)	19.8 (247.5)	49.3 (553.9)
All	19.2	27.1	15.6 (81.2)	41.7 (153.9)	20.5 (106.8)	69.5 (256.4)
<i>Non-fusion</i>						
20-64	55.7	141.8	56.6 (101.6)	150.1 (105.8)	62.9 (112.9)	139.5 (98.4)
≥ 65	39.8	93.7	57.6 (144.7)	163.0 (174.0)	56.5 (142.0)	186.5 (199.0)
All	52.9	133.3	56.8 (107.4)	152.4 (114.3)	61.8 (116.8)	147.7 (110.8)

Our findings on differences in the supply of imaging units are supported by research on perceived access to these technologies: in 1991 a smaller proportion of US physicians (16%) than Canadian physicians (37%) reported being unable to secure a needed complex diagnostic test, such as CT or MRI, for a patient 3 or more times.³¹ The more dramatic increase in admission rates for surgery among patients aged 65 or more in the US may reflect a growing willingness to operate in the older population, an increased recognition of age-related conditions such as spinal stenosis because of improvements in imaging, and the narrower range of patient and physician incentives for reduced use in the Medicare system for older patients.

We have no reason to believe that the prevalence of neck and back problems differed between Ontario and the US or diverged over time. Although we were unable to find directly comparable prevalence data from the 2 jurisdictions, a previous study showed roughly similar prevalence rates over time within the US.³²

Several features of the data may limit their validity and generalizability. Unlike Ontario, which has collected high-quality, comprehensive data on all admissions for several decades,³³ the US NHDS includes only a sample of admissions within a sample of hospitals. Because the survey is voluntary, some hospitals do not respond (20 of 514 hospitals in 1992³⁴), and those that do respond do not always provide complete and accurate information on the abstract forms. Canada has no similar national survey; however, over 35% of Canadians live in Ontario.

This study cannot provide definitive answers to the questions of whether the observed changes in practice patterns are good or bad, or what factors account for these changes. To do so, we would need data on the appropriateness of care³⁵ and a natural or randomized experiment that held constant all factors except those under direct study. However, the results suggest that the hospital admission rates for medically treated cases declined (as might have been expected given the available evidence)

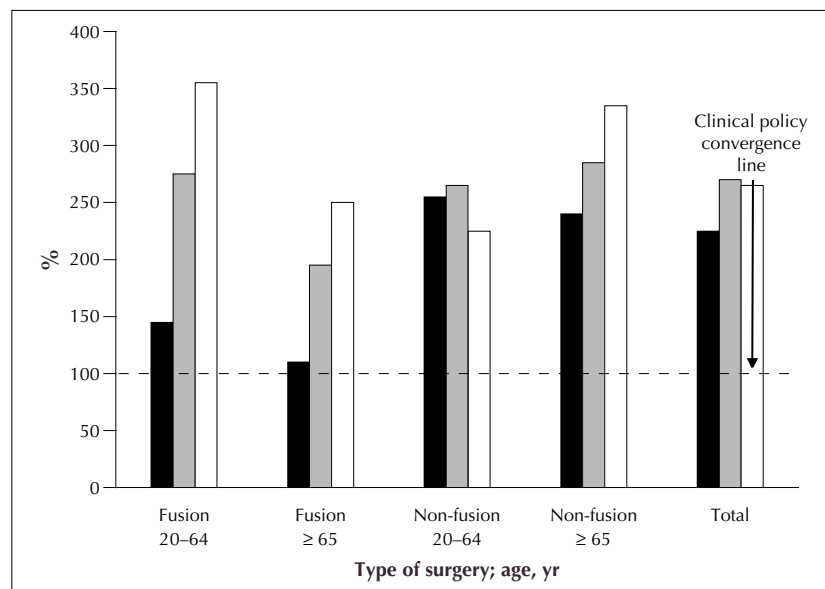


Fig. 2: Hospital admission rates in the United States, expressed as proportion of admission rates in Ontario, for surgically treated neck and back problems, by type of surgery and age. Black bars = 1982, grey bars = 1987, white bars = 1992.

Table 4: Comparison of relevant aspects of the health care systems in Ontario and the US

Variable	1982		1992 (as % of 1982)	
	Ontario	US	Ontario	US
Health care expenditures as % of gross domestic product	7.0	9.1	8.5 (121.4)	14.0 (153.8)
No. of active physicians per 1 000 000 adults				
Primary care physicians	1482	845	1220 (82.3)	993 (117.5)
Orthopedic surgeons	43	91	42 (97.7)	113 (124.2)
Neurosurgeons	9	22	9 (100.0)	25 (113.6)
No. of imaging units per 1 000 000 adults				
CT scanners	3.6	11.2	8.3 (230.6)	30.2 (269.6)
MRI scanners	0	0	1.3 (-)	8.2 (-)



but that the rates for spinal fusion increased in both Ontario and the US despite a lack of evidence to support the expanded use of the procedure. The particular features of the 2 health care systems may explain these and other findings.

Conclusion

Discretionary care, such as the hospital-based treatment of mechanical neck and back problems, and the factors that may account for changes in patterns of such care have been a neglected area of study. Our comparison of Ontario and the US suggests that 2 broad trends have occurred on both sides of the border — a decrease in hospital admission rates for medically treated cases and an increase in admission rates for surgically treated cases — but that the particular patterns of change within either system may be related to the particular incentives, mix of physicians and supply of imaging units in the system. Further work is needed to confirm these findings for other types of discretionary care and to compare the appropriateness of care and clinical outcomes for discretionary care in these 2 jurisdictions.

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**Appendix 1: Diagnosis and procedure codes for case selection**

Diagnostic or surgical category	ICD-9 codes ¹¹ (CCP codes ¹⁵ for procedures in Ontario)	Definition
Diagnostic category*		
Herniated disc	722.0-.2, 722.7	Intervertebral disc displacement without myelopathy, intervertebral disc disorder with myelopathy
Degenerative changes	721.0-.3, 721.9, 722.4-.6, 722.9	Spondylosis without myelopathy, disc degeneration, other or unspecified disc disorder
Spinal stenosis	721.1, 721.4, 723.0, 724.0	Spondylosis with myelopathy, spinal stenosis
Possible instability	723.2-.4, 724.4, 738.2, 738.4-.5	Cervico-cranial/-brachial syndrome, neuritis/radiculitis, acquired deformity, acquired spondylolisthesis
Pain syndrome	723.1, 724.1-.3, 724.5	Cervicalgia, pain in thoracic spine, lumbago, sciatica, backache at unspecified site
All other diagnoses	721.5-.8, 722.3, 722.8, 723.5, 723.7-.9, 724.6, 724.8-.9, 737.1-.2, 739.1-.4, 756.1, 846.0-.3, 846.8-.9, 847.0-.3, 847.9 (and 996.4 if another diagnosis or procedure indicates a neck or back problem)	Kissing spine, ankylosing vertebral hyperostosis, traumatic spondylopathy, other disorders of the spine, Schmorl's nodes, postlaminectomy syndrome, torticollis, ossification of posterior longitudinal ligament, other syndromes affecting cervical region, musculoskeletal disorders of neck, disorders of sacrum, other unspecified back disorders, acquired kyphosis or lordosis, nonallopathic lesions, anomalies of spine, sprain or strain (and mechanical complication of an internal orthopedic device)
Procedure category†		
Laminectomy	03.09 (16.09)	Spinal canal exploration and decompression
Discectomy	80.50-.52, 80.59 (92.31, 92.3-.4)	Intervertebral disc destruction or excision, intervertebral chemonucleolysis
Fusion	81.01-.09 (93.01-.09)	Spinal fusion, spinal refusion
Other	03.02, 03.6, 78.69‡ (16.02, 16.5, 90.68‡)	Reopening of laminectomy site, lysis of adhesions of spinal cord or nerve roots, removal of internal fixation device

*Diagnosis codes were used for case selection of both medically treated and surgically treated patients.

†Procedure codes were used for case selection of surgically treated patients.

‡Patients were excluded from the surgically treated group if mechanical complication of internal orthopedic device (996.4) was listed with codes 90.68 (Ontario) or 78.69 (US) and no other diagnosis or procedure code indicated a neck or back problem.

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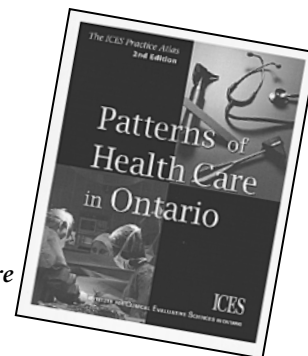
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