
HOSPITAL SPENDING IN THE UNITED STATES AND CANADA: A COMPARISON

by Joseph P. Newhouse, Geoffrey Anderson, and Leslie L. Roos

Prologue: *The rate at which Canada's citizens are hospitalized is high (1,242 days per 1,000 residents) and the lengths-of-stay for all levels of care in private voluntary hospitals long (11.5 days). Canada's hospitals negotiate their budgets every year with, for all practical purposes, the lone payer of care—the provincial health insurance plan where they operate. In this paper, Joseph Newhouse, Geoffrey Anderson, and Leslie Roos explore the question: What accounts for the substantial differences in hospital spending between such institutions in Canada and the United States? Comparisons both between and within countries are complicated by the difficulty of defining similar hospitals and similar patient populations. Nevertheless, the question they address is compelling and warrants examination. Newhouse, an economist, is the John D. and Catherine T. MacArthur Professor of health policy and management at Harvard University. He holds a joint appointment at the Harvard Schools of Government, Medicine, and Public Health. Newhouse is also codirector of the Harvard-RAND-UCLA consortium, which provides policy analysis on selected health issues to the Health Care Financing Administration. Before joining the Harvard faculty this summer to build a strong doctoral program in health policy, Newhouse directed The RAND Corporation's Economics Department. He was the principal investigator of RAND's fifteen-year, \$82 million, federally funded health insurance study, the largest randomized trial of health care financing ever undertaken. Anderson, a physician who also holds a doctorate in health policy from the RAND graduate program, is on the faculty of the University of British Columbia. Roos, who received his doctorate in political science from the Massachusetts Institute of Technology, is a member of the faculty of management at the University of Manitoba. Roos has built a distinguished career in health services research, in part by mining a rich claims database maintained by Manitoba's provincial health insurance plan.*

Numerous health policy analysts on both sides of the border have discussed the Canadian method of financing medical care as a possible model for the United States.¹ Canada not only has achieved universal coverage but spends substantially less per capita on health than the United States. Those favoring the Canadian model have tended to assume that the savings in cost come with minimal or no effect on the quality of care or health outcomes. On the contrary, because of universal coverage, health outcomes averaged over the Canadian population as a whole may even exceed those in the United States. However, the U.S. debate over whether the Canadian system is superior has paid less attention to health outcomes than to differences in cost and coverage levels. In Canada, by contrast, there is no serious advocate of the U.S. system.

In this article, we do not examine differences between the two countries in health outcomes, but we do examine the differences in the use of acute care hospitals—the largest single component of health care expenditures in both countries. We compare the countries in terms of three measures of hospital utilization: (1) admissions, (2) length-of-stay, and (3) case-mix, measured using the weights attached to the diagnosis-related groups (DRGs) of the U.S. Medicare program. We limit the analysis to the care provided to individuals age sixty-five and older because they receive universal public insurance in both countries.² Thus we can attribute differences in use to factors other than differences in insurance coverage and can compute rates of use for defined populations. While our analysis does not compare the ultimate effects of differences in health care expenditures between the two countries, it does provide a first step toward a better understanding of the factors that drive those differences.

Hospital Use In The United States And Canada

We compare utilization in two Canadian provinces with both the United States as a whole and selected states geographically close to the two provinces. We chose the two provinces because of data availability. However, they contain 40 percent of the Canadian population; also, results for the two provinces are similar, suggesting that our conclusions may hold for a comparison of all of Canada with the United States.

Data sources and numbers. For the United States, our data come from a 20 percent sample of all Medicare hospital claims in calendar year 1981 and fiscal years 1984 and 1985. From this file we deleted claims from the four states that at that time had waivers from the prospective payment system (PPS)—Maryland, Massachusetts, New Jersey, and New York. Thus, references to the entire United States mean only forty-six states.

We also deleted claims from Puerto Rico and the Virgin Islands, although including them would have negligible effects because they are so small. We also deleted claims for those under age sixty-five.

For Canada, the data come from a 100 percent sample of claims from Ontario and Manitoba. Although we compare both provinces with the entire United States, we also compare Ontario with Michigan and Ohio, and Manitoba with North Dakota and Montana. The samples from each of the two-state areas are about half as large as the comparable provinces.

Type of provider and case-mix. The goal of our analysis was to compare the use of acute care hospital services in the two countries. However, differences in the definitions of institutions and units exist. To make our comparisons as similar as possible, we excluded cases in rehabilitation and long-term care hospitals and units. We used the following methods to define use of acute care beds.

In Ontario, each discharge abstract contains a variable that identifies the institution from which the individual was discharged. Each institution is assigned a unique identifier. Long-term care and rehabilitation units within acute care hospitals are assigned identifiers that are distinct from the number assigned to the acute care section of the hospital. A transfer from an acute care section to a rehabilitation or long-term care section of the same institution produces a discharge abstract. A discharge was included in the analysis only if it was from an identified acute care institution. Discharges from acute care psychiatric units were included.

In Manitoba, each discharge abstract contains a service code indicating the type of care received by the patient during the admission. Patients receiving personal care, physical medicine and rehabilitation, geriatrics, and extended treatment were excluded from the analysis. Patients receiving psychiatric or psychogeriatric care were included.

In the United States, certain hospitals—rehabilitation, chronic or long-term, psychiatric, and children’s—were exempt from PPS, which began in October 1983. Unfortunately, we cannot identify these exempt hospitals in 1981. We have therefore estimated 1981 admission and case-mix figures using the relationship between acute care hospitals (and psychiatric hospitals) and all hospitals in 1984 and 1985. Specifically, to estimate a figure for admissions and the case-mix index for 1981, we used the admission (case-mix) figure for all hospitals for 1981 and multiplied it by the ratio of admissions (case-mix) in all hospitals other than long-term and rehabilitative to admissions (case-mix) in all hospitals. This ratio was available for both 1984 and 1985; we averaged the two values.

Only around 5 percent of all admissions occurred in rehabilitative and long-term care hospitals and units in both 1984 and 1985, and, if any thing, the value was probably lower in 1981 because of fewer such units.

Our method for estimating a 1981 rate therefore effectively decreased the admission rate to all hospitals (including rehabilitative and long-term) in 1981 by about 5 percent. The resulting 1981 admission rate for the United States may be slightly too low, but any error is almost certainly not serious enough to affect the comparisons with Canada.

The value for the case-mix index is about 1 percent higher in both 1984 and 1985 if cases in rehabilitation and long-term hospitals and units are excluded. Hence, our methods led us to increase the case-mix index for all hospitals in 1981 by about 1 percent. That adjustment also does not affect any of our comparisons.

Length-of-stay. Unlike admissions and the case-mix index, the 1981 length-of-stay values are sensitive to the adjustment process, because of the long lengths-of-stay in rehabilitation and long-term care hospitals and units (mean values in the United States of fifty days in 1984 and thirty five days in 1985). To reduce the sensitivity of our length-of-stay comparisons to errors in classification of cases, we began by computing not only the usual mean but also a trimmed mean by setting all stays of over sixty days equal to sixty days. This reduced the influence of very long-stay cases. However, when we then adjusted the 1981 U.S. values in the same way that we adjusted admissions and case-mix, we obtained the anomalous result that the adjusted trimmed length-of-stay exceeded the adjusted untrimmed length-of-stay. Hence, we have followed the simple step of reporting the length-of-stay values for all U.S. hospitals for 1981 (both untrimmed and trimmed). Although this will overestimate length-of-stay in hospitals other than rehabilitation and long-term, the values are still well below the Canadian values, so that our qualitative conclusions are unaffected. In the U.S. data, we have excluded discharges from skilled nursing facilities.

Population data. U.S. enrollee data come from the Health Care Financing Administration (HCFA). These data are for 1984 and come from aggregating enrollees by zip code. To project the number of enrollees for 1981 and 1985, the total number of Part A enrollees over age sixty-five in 1981, 1984, and 1985 in the entire country was used.³ The number of enrollees in each of the two subregions analyzed in 1981 and 1985 was assumed to change proportionally the same as the national number (0.9439 for 1981 and 1.0211 for 1985, both relative to 1984). In Canada, federal support for the provincially administered health care systems is contingent upon universal coverage of the population. Therefore, census data were used to identify the eligible populations in Ontario and Manitoba.

We have not age- and sex-adjusted our figures because the age-sex distributions are virtually identical. Using five-year age groups for each

sex (through age eighty-five), the percentage of the population in each group in North Dakota and Montana is always within one percentage point of the group in Manitoba; similarly, the percentage for Michigan and Ohio is almost always within one percentage point of the group in Ontario (one case differed by 1.3 points). We cannot compare costs or charges at the case level directly because Canada does not associate costs or charges with a particular case in its global budgeting method.

Results Of The Comparison

As is commonly known, real personal health expenditure per person is substantially higher in the United States than in Canada; we estimate that the United States spent about 50 percent more per person throughout the first part of the 1980s (Exhibit 1). Similar percentage differentials also applied to hospital services. Hospital expenditure per capita in Manitoba is identical to that in all of Canada.

To examine in more detail what might account for these differences in the level of hospital expenditure, we examined admission rates and lengths-of-stay between 1981 and 1985 (Exhibits 2 and 3). Admission rates were comparable between Michigan/Ohio and Ontario in 1981 and 1984, and were lower in Michigan in 1985. Although admission rates in Montana/North Dakota fell 15 percent from 1984 to 1985, they remained about 10 percent above those in Manitoba and well above those for the United States. On the whole, by 1985, admission rates in the two countries seem approximately the same. In contrast, length-of-stay differs markedly between the two countries. Length-of-stay in Manitoba was approximately double the length-of-stay in Montana/North Dakota,

Exhibit 1
Health Expenditure Per Capita In The U.S. And Canada, 1981–1985, 1985 U.S. Dollars^a

Year	United States		Canada		Manitoba
	Personal health expenditure per capita	Hospital expenditure per capita	Personal health expenditure per capita	Hospital expenditure per capita	Hospital expenditure per capita
1981	\$1,260	\$590	\$800	\$380	\$380
1984	1,440	670	1,010	470	470
1985	1,500	680	1,010	460	460

Sources: Data for United States 1981, 1984, K. R. Levit et al., "National Health Expenditures, 1984," *Health Care Financing Review* (Fall 1985); for 1985, D. Waldo et al., "National Health Expenditures, 1985," *Health Care Financing Review* (Fall 1986). Data for Canada, *National Health Expenditures in Canada, 1975–1985; National Health and Welfare, 1987; Quarterly Economic Review*, Annual Reference Tables (Department of Finance, Canada, June 1987); Manitoba Health Services Commission, Annual Reports. Converted to U.S. dollars at exchange rates of 1.199 for 1981, 1.295 for 1984, and 1.366 for 1985.

^aUses United States gross national product (GNP) consumption deflator.

Exhibit 2**Hospital Admission Rates For People Over Age Sixty-Five, Selected States And Provinces**

Year	Ontario	Michigan/ Ohio	Manitoba	North Dakota/ Montana	All United States ^a
1981	.33	.33 ^b	.32	.41 ^b	.34 ^b
1984	.35	.36	.32	.44	.37
1985	.35	.32	.34	.38	.33

^aExcludes waiver states of Maryland, Massachusetts, New Jersey, and New York.

^bEstimated; see text.

while length-of-stay in Ontario was notably longer than in Michigan/Ohio, especially by 1985. North Dakota/Montana had somewhat shorter stays than the US. average, and Michigan/Ohio had somewhat longer stays.

Exhibit 3**Length-Of-Stay For People Over Age Sixty Five, Selected States And Provinces, In Days**

Year	Ontario	Michigan/ Ohio	Manitoba	North Dakota/ Montana	All United States ^a
1981	14.43	11.11 ^b	15.88	8.35 ^b	9.90 ^b
1984	14.48	9.40	15.38	7.64	8.66
1985	14.25	8.60	15.77	7.16	8.07

^aExcludes waiver states of Maryland, Massachusetts, New Jersey, and New York.

^bValue is overestimated because it includes stays at rehabilitation and long-term care hospitals and units; see text.

To determine how length-of-stay might be affected by very long-stay patients, we recomputed the mean length-of-stay by trimming stays at sixty days (that is, patients with stays longer than sixty days were set equal to sixty days). The results are shown in Exhibit 4. Stays in Manitoba are particularly affected, falling by three to four days. Values for the United States are not much changed. Nonetheless, even after reducing the effect on the mean of these very long-stay patients, there remain substantial differences between the countries in mean length-of-stay.

Exhibit 4**Length-Of-Stay For People Over Age Sixty-Five, Selected States And Provinces, Stays Trimmed At Sixty Days**

Year	Ontario	Michigan/ Ohio	Manitoba	North Dakota/ Montana	All United States ^a
1981	13.27	10.98 ^b	11.07	8.23 ^b	9.75 ^b
1984	13.43	9.25	12.29	7.41	8.48
1985	13.32	8.48	12.16	6.77	7.96

^aExcludes waiver states of Maryland, Massachusetts, New Jersey, and New York.

^bValue for all hospitals; see text.

Results for the case-mix index are somewhat difficult to interpret because of the rapid increase in the U.S. index, much of which has been attributed to better coding procedures (Exhibit 5).⁴ By contrast, the values for Canada have increased at a rate of half a percent to a percent a year, which is similar to the pre-PPS trend of a half percent a year that Grace Carter and Paul Ginsburg estimated for the United States.⁵

Exhibit 5
Case-Mix Index For People Over Acre Sixty-Five, Selected States And Provinces

Year	Ontario	Michigan/ Ohio	Manitoba	North Dakota/ Montana	All United States ^a
1981	1.10	1.08 ^b	1.07	0.96 ^b	1.01 ^b
1984	1.11	1.13	1.08	1.10	1.12
1985	1.12	1.19	1.09	1.20	1.19

^aExcludes waiver states of Maryland, Massachusetts, New Jersey, and New York.

^bEstimated; see text.

What Accounts For The Difference?

In the early 1980s, the United States spent nearly 50 percent more per person on hospital services than Canada; the important question is what, if anything, the United States bought for that additional expenditure. To shed light on that question, we have decomposed hospital spending in two provinces and compared the anatomy of that spending with two comparable areas in the United States and the United States as a whole.

Overall, our findings, which apply only to the elderly, somewhat deepen the puzzle of what the United States might be buying. By 1985, admission rates were roughly comparable in the two countries, being somewhat higher in North Dakota and Montana than in Manitoba, but somewhat lower in Michigan and Ohio than in Ontario. The U.S. admission rate was marginally below that of the two provinces. Hence, the differences in spending between the two countries cannot be attributed to a higher rate of hospital admissions in the United States.

In each of the three years we examined, lengths-of-stay were markedly longer in Canada. The considerable fall in length-of-stay in the United States was not matched in Canada. By 1985, lengths-of-stay in Ontario were more than two-thirds again as long as in Michigan and Ohio, and in Manitoba were more than double the lengths-of-stay in North Dakota and Montana. Because admission rates were roughly similar (in 1985), the number of patient days per person over age sixty-five in the United States are only 50 to 60 percent of the corresponding number in Canada. It follows from the values in Exhibit 1 that spending per patient day is

perhaps three times as great in the United States as in Canada.

Case-mix. To understand why the United States might be spending half again as much per case and three times as much per day, we examined the case-mix index for the two countries. Comparison between the two countries is complicated by the rapid rate of increase in the U.S. index that can be attributed to PPS. Coding now affects the hospital's reimbursement; this has resulted in both a substantial increase in the accuracy of the coding and an incentive to code cases in higher-weighted DRGs. Neither of these effects was present in Canada.

If we judge the comparability of case-mix using data from 1981, a time when coding incentives in the two countries were more nearly similar, the case-mix index is higher in Canada; this is especially true of the comparison between Manitoba and North Dakota/Montana. In 1984 the two countries were roughly comparable, although by 1985 the United States had a somewhat higher case-mix index. If one could adjust for upcoding, however, it is likely that the 1985 U.S. value would be equal to or below the Canadian.⁶ The similarity of the annual change in case-mix in Canada with the annual U.S. change prior to PPS strongly suggests that most of the change in the United States was not true change. Even if the 1985 difference between the United States and Canada is true (which we think is unlikely), case-mix, as measured by DRGs, can at best account for only a small portion of spending differences.

Thus, the difference in hospital spending between the two countries, which may account for around 40 percent of the difference in total expenditure between the two countries, must be accounted for primarily by differences in the cost of a "case-mix index unit" per beneficiary. With admissions and the case-mix index in the two countries at approximately the same level, the cost of a case-mix unit in the United States was approximately 50 percent higher than in Canada. What might account for such a difference? The Canadian method of global budgeting, of course, makes it easier to control costs, and some discussions appear to assume that the additional American costs are pure inefficiency. However, other factors ought to be considered.

Severity of illness. Differences in severity or complexity within DRGs could be such that American patients are sicker. There is no reason, however, to think that this is the case; indeed, the similar admission rates and longer lengths-of-stay in Canada, if anything, point in the other direction. Lack of insurance coverage, which could lead to increased severity of illness in some under age sixty-five admitted to a U.S. hospital, should not play an important role in the Medicare population.

Volume of services. American patients could have more done to or for them when in the hospital. Not only could there be more tests and other

ancillary procedures, but staffing ratios could be higher. Indeed, staffing ratios per patient day in the United States appear to be almost double those in Ontario. There were 3.47 employees per adjusted census in nonfederal short-term general and other special hospitals in the United States in 1981, and 1.87 per inpatient day in 1980–1981 in Ontario.⁷ However, staffing ratios per stay or per person in the population are not very discrepant between the two countries.

Higher-paid staff. Employees of American hospitals could be paid more than similar employees at Canadian hospitals. We do not have data on wages. Hospital inputs other than personnel (for example, beds) tend to be traded in international markets, so their costs should not much differ between the two countries.

Administrative costs. Certain overhead or administrative costs may differ. For example, malpractice premiums no doubt are higher in the United States than in Canada. (Note, however, that one justification of the malpractice system is deterrence of negligent actions, which, if it were effective, ought to lower U.S. hospital costs relative to Canadian.) Administrative costs to cope with multiple sources of financing and various utilization review mechanisms also may be higher in the United States. However, it is unlikely that such differences could begin to account for the magnitude of the overall difference in spending, because total administrative and accounting costs are estimated to account for only 18 percent of U.S. expenditure on personal health care versus 8 percent in Canada.⁸

A Closer Look At Length-Of-Stay Differences

Our work points up the methodological difficulties of making comparisons across countries. Although our major conclusions do not appear sensitive to definitional differences, the difficulties in developing comparable definitions of hospitals may be a problem for more detailed analysis of the two countries. Indeed, even within each country there are difficulties with hospital definition. For example, the figures often cited to show the decline in length-of-stay caused by PPS do not compare patients in the same hospitals over time.⁹ As a result, the well-known fall in length-of-stay resulting from PPS is overstated. If one includes patients in exempt hospitals in 1981 and 1984, average length-of-stay actually rose among those age sixty-five and over, from 9.9 days to 10.7 days in 1984; in 1985, however, length-of-stay fell to 9.5 days.¹⁰

Because of the importance of hospital definition in the number of long-stay patients and the importance of such patients in the overall length-of-stay figures, we compared the percentage of patients in the two countries with stays of over sixty days. Two conclusions emerged (Exhibit

6). First, U.S. data for all hospitals show a substantial increase in long-stay patients between 1981 and 1985. At the same time, long-stay patients in PPS-covered hospitals have decreased. (Of course, PPS gives a considerable reward for caring for long-stay patients in exempt hospitals or units.) Hence, average length-of-stay figures will be sensitive to the definition of hospital used and to the nature of patients in those hospitals.

Second, comparing the United States with Ontario and Manitoba shows that the proportion of patients with very long stays is considerably greater in Canada, especially in Manitoba; this proportion has been increasing in Ontario as well as in the United States (though not in Manitoba). The proportion of elderly with very long stays also has been increasing in British Columbia.¹¹ The reasons for this increase remain to be explored, but a small increase can cause a dramatic change in the average length-of-stay. For example, the average U.S. length-of-stay for patients staying over sixty days in 1985 was 130 days. Hence, a one-percentage-point increase in such patients will raise average length-of-stay 1.3 days. Given the increases in long-stay patients, government insurers might well want to investigate ways to reduce length-of-stay.

Although this is only a first look at comparing Canada and the United States, patients at U.S. hospitals appear to use either more inputs or more highly paid inputs (or both) than do patients at Canadian hospitals. This difference in intensity appears to account for the bulk of the difference in hospital spending between the two countries. If so, the ultimate question is what the United States buys with the additional intensity, if anything. That question can best be addressed with data that pertain to outcomes. The most readily available outcome data are mortality data, but they are too crude to answer the question. Readmissions data for complications and other poor outcomes following surgery are another available indicator of outcome. Lacking comprehensive measures of outcome, one reasonable next step is to pursue the type of analysis used here at the level of specific diseases and treatments.

Exhibit 6

Percentage Of Patients Over Age Sixty-Five Staying Over Sixty Days

	1981	1984	1985
United States			
All hospitals	0.5	1.4	1.0
All excluding rehabilitation and long-term	-	0.4	0.2
Ontario ^a	2.7	3.0	2.9
Manitoba ^b	5.0	5.0	5.0

^aAll patients excluding rehabilitation and long-term.

^bExcludes stays in personal care units, geriatrics, and extended treatment hospitals.

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NOTES

1. S. Andreopoulos, ed., *National Health Insurance: Can We Learn from Canada?* (New York: John Wiley & Sons, 1975); and J.K. Iglehart, "Canada's Health Care System," *The New England Journal of Medicine* (July and September 1986): 202–208 and 778–784.
2. In the United States, the widespread nature of so-called Medigap policies makes cost sharing for hospital services among those over sixty-five unimportant. Approximately 75 percent of people over sixty-five were covered by Medigap policies, and another 8 percent were covered by Medicaid, although not all Medigap policies cover all cost sharing. The remaining sixth face a deductible equal to the average cost of one day in the hospital. United States Department of Commerce, *Statistical Abstract*, 1988 (Washington, D.C.: U.S. Government Printing Office, 1987).
3. United States Department of Commerce, *Statistical Abstract*, 1987 (Washington, D.C.: U.S. Government Printing Office, 1986).
4. G. Carter and P.B. Ginsburg, *The Medicare Case-Mix Index Increase: Medical Practice Changes, Aging, and DRG Creep*, Pub. no. R-3292-HCFA (Santa Monica, Calif.: The RAND Corporation, 1985).
5. Ibid.
6. Ibid.
7. American Hospital Association, *Hospital Statistics*, 1986 (Chicago: AHA, 1986); and A. Detsky, S.R. Stacey, and C. Bombardier, "The Effectiveness of a Regulatory Strategy in Containing Hospital Costs—The Ontario Experience, 1967–1981," *The New England Journal of Medicine* (21 July 1988): 151–158.
8. These numbers are suspect because definitions may not be comparable; even so, they demonstrate that it is unlikely that differences in administrative costs could account for a majority of the difference. D.U. Himmelstein and S. Woolhandler, "Cost Without Benefit," *The New England Journal of Medicine* (13 February 1986): 441–445.
9. J.P. Newhouse and D.J. Byrne, "Did Medicare's Prospective Payment System Cause Length-of-Stay to Fall?" *Journal of Health Economics* (December 1988), forthcoming.
10. The trimmed mean (trimmed at sixty days) fell from 9.7 days in 1981 to 9.5 days in 1984 to 8.9 days in 1985. Standard errors on the untrimmed means are around 0.01 to 0.02.
11. R.G. Evans et al., "The Long Good-Bye: The Great Transformation of the British Columbia Hospital System," University of British Columbia, Discussion Paper HPRU 88:2. March 1988.