
DataWatch

Medical Technology In Canada, Germany, And The United States: An Update

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Abstract: Major medical technology is internationally mobile and rapidly diffusing. This study compares the proliferation of six complex medical technologies in Canada and Germany with that in the United States, the traditional high-tech leader. The technologies—open-heart surgery, cardiac catheterization, organ transplantation, radiation therapy, extracorporeal shock wave lithotripsy, and magnetic resonance imaging—are more prevalent in the United States, on a per capita basis, than in the other two countries. This was the case five years ago, too. The differences are large in some cases and small in others. Lithotriptors and imagers are growing annually at double-digit rates in all three countries.

Five years ago, to compare the proliferation of high-technology resources in medical diagnosis and treatment, I presented estimates on the adoption of six large-scale medical technology products in Canada, Germany, and the United States.¹ That study suggested several conclusions. First, under pressure from various quarters inside and outside of government, medically advanced countries have accepted a heavy reliance on capital-intensive systems as a condition for maintaining their health care establishments. Second, the major technology used for modern medical care is rapidly increasing in capability and cost. Third, by international standards, the population-adjusted supply of certain large-scale technologies available to American physicians and patients in the late 1980s was extraordinarily high. Fourth, while the U.S. proliferation of greater numbers of these technologies may promote more rapid access to advanced medical services, this greater proliferation is not necessarily associated with good outcomes, more patient utilization, or efficient use of health care funds. Fifth, health policy leaders urgently need to examine the nation's resource needs and to assess the role that "big-ticket" technological products and processes play in the fulfillment of those needs.

This DataWatch updates the status of the proliferation of large-scale medical technology in these countries and assesses changes since the earlier study. The aims are to allow international comparisons of installed units

and to identify short-term trends in their availability. The technologies surveyed are open-heart surgery, cardiac catheterization, organ transplantation, megavoltage radiation therapy, extracorporeal shock wave lithotripsy, and magnetic resonance imaging (MRI). By all accounts, these modality and imaging options remain commonplace technologies with wide medical applicability across medically advanced countries. These technologies were selected primarily because of the availability of data. Sophisticated medical technology is a diverse field; no claims can be made about whether these six items are representative.

The data source for Canada was the Canadian Coordinating Office for Health Technology Assessment, which systematically documents the issue in that country. German data were obtained from the office of the Federal Ministry of Health, the German Hospital Association, and Beratungsgesellschaft für angewandte Systemforschung (BASYS). For the United States, data sources were the American Hospital Association, Medical Data International, the American College of Radiology, and the Health Care Technology Institute. The Canadian and German data are for 1993, while most of the U.S. data are for 1992. The 1993 figures for Germany refer to both the original and the new states of the Federal Republic. The German base-year figures in the late 1980s refer to the original states only, so the analysis of population-adjusted growth rates in Germany is based on differing concepts. The resulting estimate of time trends in Germany could well be of a lower order of accuracy than the growth estimates for Canada and the United States. In contrast to the common situation in international health comparisons, it is unlikely that the three countries employ different definitions of the technologies examined.

Results

Exhibit 1 presents the comparative availability of the selected technologies. The exhibit shows estimates of the numbers of installed units, the units per one million population, and the average annualized rate of change (compound rate of change) in the units per million people since the late 1980s. The base years are generally 1987 in Germany and the United States, and 1989 in Canada. Therefore, small differences in rates of annual growth between countries should be interpreted cautiously.

The data indicate that availability of all types of the selected large-scale technology was greater in the United States than in the other two countries, ranging from more than a tenfold difference between a country pair to less than a twofold difference. The United States had distinctly higher MRI availability: 2,900 MRI units, or 11.2 per million population. This contrasts with 1.1 units per million in Canada and 3.7 units per million in Germany.

Exhibit 1

Comparative Availability Of Selected Medical Technologies, Canada, Germany, And United States, 1992-1993

	Canada (1993)			Germany (1993)			United States (1992)		
	Number of units	Units per million persons ^a	Change since 1989 ^b	Number of units	Units per million persons	Change since 1987 ^c	Number of units	Units per million persons	Change since 1987
Open-heart surgery	36	1.3	1.3%	61	0.8	0.4% ^d	945	3.7	2.6%
Cardiac catheterization	78	2.8	17.0	277	3.4	4.5	1,631	6.4	4.8
Organ transplantation	34	1.2	3.2	39	0.5	1.0 ^d	612	2.4	12.9
Radiation therapy	32	4.8	11.0	373	4.6	6.7	2,637	10.3	2.3
Lithotripsy	13	0.5	24.0 ^d	117	1.4	27.3	480	1.9	14.9
MRI ^e	30	1.1	18.6 ^d	296	3.7	25.5	2,900 ^f	11.2 ^g	20.4

Sources: For Canada, Canadian Coordinating Office for Health Technology Assessment, Technology Brief-issue 5.3 (January 1994). For Germany, Bundesgesundheitsminister as reported in *Arzt und Wirtschaft* 6 (June 1994); Deutsches Krankenhaus Gesellschaft; and Landerumfrage des Krankenhausausschusses der AGLMB as reported to BASYS. For the United States, American Hospital Association, Hospital Statistics 1992-93 (Chicago: AHA, 1993); Medical Data International, MedPRO (June 1992, January 1994); American College of Radiology; and Health Care Technology Institute.

^a Midyear population estimates as reported in U.S. Bureau of the Census, Statistical Abstract of the United States; 1993 (113th ed.). Canadian figures based on 1992 population estimates.

^b Average annualized rate of change based on figures from, and revisions to, D. Rublee, "Medical Technology in Canada, Germany, and the United States," *Health Affairs* (Fall 1989): 180.

^c 1987 and 1988 data do not include Germany's live new states.

^d 1988.

^e Magnetic resonance imaging.

^f 1993.

^g Based on 1993 population estimate.

The differences in open-heart surgery units were large also. In 1992 the United States had 945 installed open-heart surgery units, about 3.7 units per million people. In Canada 1.3 per million and in Germany 0.8 per million were available. For three of the technologies, the population-adjusted availability was higher in Canada than in Germany, and vice-versa for the other three.

The differences in the availability of extracorporeal shock wave lithotripsy and cardiac catheterization between the United States and Germany were not great, although, to repeat a point made earlier, the years are different. The United States had about 480 lithotriptors, or 1.9 per million population, while Germany had 1.4 units per million. Cardiac catheterization centers numbered 1,631 in the United States, about 6.4 centers per million. Germany had about 3.4 such centers per million. Organ transplantation was only two times more available in the United States than in Canada.

The time trends show that the technologies were implemented at very uneven rates, although, again, caution should be exercised in interpreting

the figures for Germany. In no case was there a reduction in the population density of a technology. Canada had the greatest yearly increase in cardiac catheterization and megavolt radiation therapy; Germany in lithotripsy and MRI; and the United States in open-heart surgery and organ transplantation. Lithotripsy and MRI—two technologies now available in many settings outside the hospital—grew very rapidly over the recent years. The density of lithotriptors in the German population grew more than 27 percent per year. MRIs increased roughly 20 percent per year in Canada and the United States. The yearly increase in open-heart surgery was somewhat small.

Discussion

Overall, these technologies are more readily available now to U.S. physicians and patients, sometimes by a wide margin.² Generally, after adjustment for differences in population levels, Canada and Germany are about equally restrictive compared with the United States. Adoption rates have been very uneven over the past five years, both within each country and among the particular technologies studied. Lithotriptors and imagers are growing annually at double-digit rates in all three countries. When it comes to the six advanced technologies compared in this study, it is not clear that Canada's health system, with sole-source funding and regionalization, has been subjected to tighter controls over the growth of sophisticated forms of medical technology than has been the case in either Germany or the United States.

The net effect of high-technology medical resources has been to broaden physicians' patient care capabilities dramatically, to enhance exports in the global market, and to raise major health and economic policy questions. While these resources have proved to be invaluable in a variety of clinical circumstances, their proliferation has unquestionably added to the cost of medical care and, in cases in which volumes are low, may be associated with poor patient outcomes.³ Thus, the results are ambiguous: The greater proliferation in the United States could mean higher-quality health care or more wasteful or possibly harmful health care. While the appropriate level of availability of any given technology is unknown, health system reform that does not address the problem of proliferating technology will not deal effectively with the problem of escalating health spending.

NOTES

1. D.A. Rublee, "Medical Technology in Canada, Germany, and the United States," *Health Affairs* (Fall 1989): 178-181.
2. The categories of major technologies are broad; within categories, specific differences in availability of technology can and do occur. See M. Bortin, M. Horowitz, and A. Rimm, "Increasing Utilization of Allogeneic Bone Marrow Transplantation: Results of the 1988-1990 Survey," *Annals of Internal Medicine* (15 March 1992): 505-512; and U.S. General Accounting Office, *Bone Marrow Transplantation: International Comparisons of Availability and Appropriateness of Use*, Pub. no. GAO/PEMD-94-10 (Washington: U.S. Government Printing Office, 1994).
3. G.A. Glazebrook, "Radiation Therapy: A Long Term Cost Benefit Analysis in a North American Region," *Clinical Oncology* 4 (1989): 302-305; D.J. Cohen et al., "Economics of Elective Coronary Revascularization: Comparison of Costs and Charges for Conventional Angioplasty, Directional Atherectomy, Stenting, and Bypass," *Journal of the American College of Cardiology* 22 (1992): 1052-1059; H. van den Brand et al., "Comparison of Costs of Percutaneous Transluminal Coronary Angioplasty and Coronary Bypass Surgery for Patients with Angina Pectoris," *European Heart Journal* (1990): 765-771; A.A. Skolnick, "Are There Too Many U.S. Transplantation Centers? Some Experts Suggest Fewer, Cheaper, and Better," *Journal of the American Medical Association* 271 (1994): 1062-1063; W. Berens et al., "Wirtschaftlichkeitsanalyse für Medizinisch-Technische Großgeräte," *Führen und Wirtschaften im Krankenhaus* 9 (1989): 111-116; and U.S. General Accounting Office, *Hospital Costs: Adoption of Technologies Drives Cost Growth*, Pub. no. GAO/HRD-92-120 (Washington: GAO, September 1992).