Health Care Spending And Use Of Information Technology In OECD Countries

The United States is an outlier in both its health spending and its use of health information technology.

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ABSTRACT: In 2003, the United States had fewer practicing physicians, practicing nurses, and acute care bed days per capita than the median country in the Organization for Economic Cooperation and Development (OECD). Nevertheless, U.S. health spending per capita was almost two and a half times the per capita health spending of the median OECD country. One proposal for both lowering health spending and improving quality is the adoption of health information technology (HIT). The United States lags as much as a dozen years behind other industrialized countries in HIT adoption—countries where national governments have played major roles in establishing the rule, and health insurers have paid most of the costs. [*Health Affairs* 25, no. 3 (2006): 819–831; 10.1377/hlthaff.25.3.819]

THE UNITED STATES CONTINUES TO HAVE the highest per capita health care spending among industrialized countries, according to the most recent data from the Organization for Economic Cooperation and Development (OECD). In 2003, U.S. health spending per capita was $5,635, almost two and a half times more than the comparable median for OECD countries ($2,280 per capita) (Exhibit 1).[1] Fifteen percent of U.S. gross domestic product (GDP) was spent on health care in 2003; the OECD median was 8.4 percent.

The Centers for Medicare and Medicare Services (CMS) estimates that the U.S. health care sector will use 16.5 percent of GDP in 2006 and 20.0 percent by 2015.[2] It is unlikely that any other country in the OECD will approach these figures by 2015, even though most OECD countries, with the exception of Canada and Australia, will have much older populations.

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EXHIBIT 1
Health Spending In Organization For Economic Cooperation And Development (OECD) Countries, 2003

	Health spending per capita			Health spending per capita, by component (U.S. $PPP)			
Country	Total health spending (U.S. $PPP)	Average real annual growth, 1993-2003 (%)	Health spending as percent of GDP	Outpatient	Inpatient	Drugs and other medical goods	Other health
Australia	2,699[a]	4.2[b]	9.3[a]	645[c]	1,024[c]	353[c]	677[c]
Austria	2,280[a]	1.9[b]	7.6[a]	719[a]	871[a]	367[a]	323[a]
Belgium	2,827	3.7	9.6	–[d]	–[d]	–[d]	–[d]
Canada	3,003	2.5	9.9	837	842	507	817
Czech Republic	1,298	3.6	7.5	368	440	284	206
Denmark	2,763	2.3	9.0	788	1,400	272	303
Finland	2,118	2.2	7.4	635	837	339	307
France	2,903	2.4	10.1	665	1,196	606	436
Germany	2,996	2.3	11.1	623	1,073	436	864
Greece	2,011	4.0	9.9	–[d]	–[d]	322	1,689
Hungary	1,115[a]	3.9[b]	7.8[a]	252[a]	323[a]	308[a]	232[a]
Iceland	3,115	4.8	10.5	678	1,760	453	224
Ireland	2,386[a]	8.0[b]	7.3[a]	–[d]	–[d]	261[a]	2,215[a]
Italy	2,258	2.1	8.4	682	937	498	141
Japan	2,139[a]	3.1[b]	7.9[a]	692[a]	855[a]	393[a]	199[a]
Korea	1,074	7.3	5.6	386	241	309	138
Luxembourg	3,190[a]	3.4[b]	6.1[a]	869[a]	1,285[a]	370[a]	666[a]
Mexico	583	1.8	6.2	175	221	125	62
Netherlands	2,976	3.4	9.8	647	1,178	340	811
New Zealand	1,886	3.4	8.1	–[d]	–[d]	–[d]	–[d]
Norway	3,807	5.2	10.3	675	1,724	341[a]	1,067[e]
Poland	677[a]	4.7[b]	6.0[a]	–[d]	–[d]	–[d]	–[d]
Portugal	1,797	4.9	9.6	–[d]	–[d]	–[d]	–[d]
Slovak Republic	777	–[d]	5.9	119	236	299	123
Spain	1,835	2.7	7.7	727	499	401	208
Sweden	2,594[a]	3.6[b]	9.2[a]	1,237[a]	809a	339[a]	209[a]
Switzerland	3,781	2.7	11.5	1,033	1,812	398	538
Turkey	–[d]	–[d]	–[d]	–[d]	–[d]	–[d]	–[d]
United Kingdom	2,231[a]	4.0[b]	7.7[a]	–[d]	–[d]	–[d]	–[d]
United States	5,635	3.4	15.0	2,462	1,526	728	919
OECD median	2,280	3.4	8.4	677	904	347	315

SOURCE: Organization for Economic Cooperation and Development, *OECD Health Data 2005* (Paris: OECD, 2006).

NOTES: PPP is purchasing power parity. GDP is gross domestic product. Average real annual growth calculated by authors.

[a] 2002.

[b] 1993–2002.

[c] 2001.

[d] Data not available for 2001, 2002, or 2003.

[e] Calculated using 2003 outpatient, 2003 inpatient, and 2002 pharmaceutical expenditures.

■ **Health spending and GDP.** Health economists have long recognized that health spending per capita is positively correlated with GDP per capita.[3] If one takes as a benchmark a simple regression equation of health spending per capita (in purchasing power parities, or PPPs) on GDP per capita (in PPPs) over the OECD countries and excludes the United States and Luxembourg as outliers, assuming that GDP per capita were the only determinant of national health spending per capita,

then U.S. health spending per capita would have been only $3,673 in 2003, or $1,962 less than it is now.[4]

■ **Drivers of higher U.S. spending.** Possible explanatory factors for the higher level of U.S. health spending include service use, administrative complexity, population age, threat of malpractice litigation, defensive medicine, and lack of waiting lists.[5] We continue to find in using 2003 data, however, that the most compelling explanation remains, "It's the Prices, Stupid."[6] As we show in this paper, the United States has fewer hospital beds and physicians to treat patients and uses fewer impatient hospital days than the median OECD country. Yet in 2003 the United States continued to pay much higher prices in three key health care components: physician visits, hospital stays, and pharmaceuticals.[7]

■ **HIT and spending control.** In previous work we examined various explanations for the higher U.S. spending. In this paper we turn our attention to one proposed method of controlling health spending: the adoption of health information technology (HIT). Richard Hillestad and colleagues suggest that the electronic health record (EHR) could produce efficiency and safety savings of $142 billion in U.S. physician offices and $371 billion in U.S. hospitals over the next fifteen years.[8] Others have questioned the validity of these estimates because the savings have not been demonstrated.[9] As we show here, other countries have accepted the idea that HIT will lower health spending and improve outcomes; they are at least four to thirteen years ahead of the United States in initiating national HIT programs.[10] The centerpiece of most of these programs is the EHR, but HIT also encompasses a wide range of services including telehealth, electronic ordering systems, decision support tools, networks, and infrastructure.[11] U.S. physicians have been adopting computers, personal digital assistants (PDAs), the Internet, and Web sites at rates comparable to those of physicians in other countries.[12]

Comparison Of Health Care Spending, Resources, And Use

■ **Annual growth in health care spending.** The median growth rate for the United States (3.4 percent) for 1993–2003 is exactly the same as the median growth rate for all thirty countries in the OECD (Exhibit 1). The United States had two distinct periods of health spending during this period. Between 1993 and 1998, with the advent of managed care, it was able to hold health spending growth below the OECD median. However, from 1998 to 2003, after the bite of managed care had weakened, average annual growth was 4.6 percent, compared with the OECD median of 4.1 percent.

The OECD categorizes health spending into four categories: outpatient, inpatient, pharmaceuticals and other medical goods, and other health expenditures (Exhibit 1). These are much different from the categories used in the National Health Expenditure Accounts maintained by the CMS.[13] U.S. outpatient spending per capita is almost four times the OECD median and nearly double the second-most-costly country (Sweden). In contrast, U.S. per capita spending on inpatient

hospital services in 2003 was not the highest; Switzerland and Norway spent more. The trend in outpatient and inpatient spending over the past two decades suggests that U.S. policies to move as many services as possible out of the inpatient setting have been successful. The United States spent the most per capita on pharmaceuticals and other medical goods, although France and Canada were reasonably close. However, these latter countries pay much less for most pharmaceuticals, so it is likely that they are consuming more of them.

■ **Resources and usage patterns.** The higher level of U.S. health spending does not necessarily provide more resources or health care use. On several key indicators, the United States actually appears to provide fewer health care resources than many other OECD countries. For example, in 2003, the United States had fewer physicians, nurses, and hospital beds per capita than the median OECD country had, and one of the lowest numbers of acute care bed days per capita (only Turkey and Mexico had fewer) (Exhibit 2).

Although the United States is an early adopter of new technology, once the technology has diffused, it appears to acquire technology at rates similar to those of other industrialized countries. For example, the United States had the same number of computed tomography (CT) scanners per million people as the median OECD country had in 2003, and nine other countries had more magnetic resonance imaging (MRI) machines per capita than the United States had. Also, the United States does not always provide the most sophisticated procedures. For example, while U.S. physicians performed the highest number of kidney transplants per 100,000 people in 2003, it was tied for fourth place in the number of heart transplants and was third in the number of liver transplants (Exhibit 2).

Health Information Technology

In previous papers we have examined factors that could explain the reasons for higher U.S. spending. Here we examine the adoption of one technology that has the potential of both lowering spending and improving quality.

■ **HIT in the United States.** As noted, the United States lags behind several industrialized countries in the HIT area. Rigorous studies on the cost effects of fully wired health systems are lacking, even in countries that are leading the way and have moved in this direction partly for cost reasons. Thus, we do not mean to suggest that the U.S. status in this regard has a direct relationship to its relative performance in the area of health care costs. However, to the extent that HIT systems are cost-saving in the long run, the lack of an integrated, national IT system for health in the future could exacerbate the position of the United States relative to countries that are HIT leaders.

In April 2004, President George W. Bush established the Office of the National Coordinator for Health Information Technology (ONCHIT) to promote HIT.[14] In fiscal year 2005, the president budgeted $50 million in new funds to support ONCHIT's efforts, but Congress did not pass the appropriation.[15] As a result,

EXHIBIT 2
Supply And Use Of Selected Health Care Resources In Organization For Economic Cooperation and Development (OECD) Countries, 2003

			Hospitals		Technology		Transplants per 100,000		
Country	MDs per 1,000	Nurses per 1,000	Acute care beds per 1,000	Acute care bed days per capita	MRI units per million	CT scanners per million	Heart	Kidney	Liver
Australia	2.5[a]	10.2	3.6[a]	1.0[a]	3.7	–[b]	0.4	2.7	0.7
Austria	3.4	9.4	6.0	1.7	13.5	27.2[a]	0.8	4.7	1.8
Belgium	3.9[a]	5.8	4.0[a]	–[b]	6.6[a]	28.8	1.1[a]	3.7[a]	2.1[a]
Canada	2.1	9.8	3.2[a]	1.0[a]	4.5	10.3	0.5	3.5	1.3
Czech Republic	3.5	9.4	6.5	1.8	2.4	12.6	0.5	3.9	0.6
Denmark	2.9[a]	10.3[a]	3.4[c]	–[b]	9.1	14.5	0.5	3.3	0.7
Finland	2.6	9.3	2.3	0.8	12.8	14.0	0.4	3.1	0.8
France	3.4	7.3	3.8	1.0	2.8	8.4[a]	0.5	3.6	1.4
Germany	3.4	9.7	6.6[a]	1.9[a]	6.0[a]	14.2[a]	0.5	3.0	1.0[a]
Greece	4.4[c]	–[b]	–[b]	–[b]	2.3[a]	17.1	0.1[a]	2.1	0.2[a]
Hungary	3.2	8.6	5.9	1.7	2.6	6.9	0.1	3.3	0.3
Iceland	3.6	13.7	–[b]	–[b]	17.3	20.7	0.0	1.0	0.7
Ireland	2.6	14.8	3.0	0.9	–[b]	–[b]	0.4	3.4	0.7
Italy	4.1	5.4	3.9[a]	1.0[a]	11.6	24.0[a]	0.5	2.7	1.3
Japan	2.0[a]	7.8[a]	8.5	2.1	35.3[a]	92.6	0.0	0.7	0.0
Korea	1.6	1.7	5.9	–[b]	9.0	31.9	0.0	1.8	1.0
Luxembourg	2.7	10.6[a]	5.7	1.4	11.1	26.7	–[b]	–[b]	–[b]
Mexico	1.5	2.1	1.0	0.2	0.2	1.5	0.0	1.6	0.1
Netherlands	3.1	12.8[c]	3.2[a]	0.8[c]	–[b]	–[b]	0.2	3.7	0.6
New Zealand	2.2	9.1	–[b]	–[b]	3.7	11.5	1.2	2.8	0.9
Norway	3.1	10.4[c]	3.1	0.9	–[b]	–[b]	–[b]	4.6[a]	–[b]
Poland	2.5	4.9	5.1	1.4[a]	1.0	6.3	0.3	2.7	0.4
Portugal	3.3	4.2	3.1	0.9	3.9	12.8	0.2	3.4	1.7
Slovak Republic	3.1	6.5	5.9	1.4	2.0	8.7	0.1	1.9	0.0
Spain	3.2	7.5	3.1	0.8[c]	7.3	13.0	0.7	5.1	2.5
Sweden	3.3[a]	9.9[a]	–[b]	–[b]	–[b]	–[b]	0.3[c]	3.5[c]	1.2[c]
Switzerland	3.6[a]	–[b]	3.9	1.2	14.2	18.0	0.5	4.0	1.3
Turkey	1.4	1.7	2.3	0.4[a]	3.0	7.3[c]	0.0	0.9	0.2
United Kingdom	2.2	9.7	3.7	1.1	5.2[c]	5.8[a]	0.3	2.9	1.1
United States	2.3[a]	7.9[a]	2.8	0.7	8.6[a]	13.1	0.7	5.2	1.9
OECD median	3.1	9.2	3.8	1.0	5.6	13.1	0.4	3.3	0.9

SOURCE: Organization for Economic Cooperation and Development, *OECD Health Data 2005* (Paris: OECD, 2006).

NOTES: MRI is magnetic resonance imaging. CT is computed tomography.

[a] 2002.

[b] Data not available for 2001, 2002, or 2003.

[c] 2001.

ONCHIT relied on funds earmarked for patient safety along with other miscellaneous funds directed from the Agency for Healthcare Research and Quality (AHRQ) to operate in FY 2004 and FY 2005.

At the beginning of 2006, the most prominent HIT legislation under discussion is the Wired for Health Care Quality Act, S. 1418.[16] It passed the Senate and was referred to a House committee 6 January 2006. It would codify the creation of ONCHIT, establish a collaborative to adopt HIT standards, and authorize grant programs to encourage HIT adoption. The bill would authorize $125 million in FY

2006, $155 million in FY 2007, and "such sums as necessary" for 2008 through 2010. This represents only a small proportion of the resources that will be needed to create a fully operational HIT system. A recent study estimated that capital investments of $156 billion over a five-year period, with an additional $48 billion in operating costs, will be needed to achieve a national HIT network.[17]

■ **HIT programs abroad.** Several countries established federal committees similar to ONCHIT as many as a dozen years ago, to foster the adoption of HIT. Each of these countries has experienced difficulties implementing its HIT system, and the adoption process has been criticized by both providers and the public in those countries. As it tries to play catch-up, the United States could learn from these successes and failures.

Germany was the first country to start developing a national HIT network (1993) and also has the first expected completion date (2006). Germany is updating its smart-card technology to use advanced security features to protect the stored personal medical data.[18] In 1997, Canada established the Advisory Council on Health Infrastructure and in 2001 launched Canada Health Infoway, a nonprofit organization. Canada Health Infoway expects to have EHRs for half of the population by the end of 2009. The United Kingdom has established the National Programme for IT (NPfIT), the most expensive and perhaps the most comprehensive HIT system in development worldwide. The program anticipates creating an integrated care record service, an electronic appointment system, and an electronic prescription transmission system and will build infrastructure and networks that will be accessible to all of the major health care providers by 2014. Norway and Australia have also established major HIT initiatives, and both countries have at least a six-year head start on the United States.

■ **Providers included in HIT systems.** As currently envisioned, the United States has fewer categories of providers using EHRs than some other countries have. If the Wired for Health Care Quality Act is enacted, a wide range of providers will be required to use EHRs in the United States. The list includes hospitals, physicians, group practices, skilled nursing facilities, home health facilities, federally qualified health centers, health care clinics, Indian Health Service (IHS) clinics, rural health clinics, pharmacists, and laboratories (Exhibit 3). However, some countries also include optometrists, physical therapists, and dentists in their HIT networks.

■ **Physicians' attitudes.** Physicians are crucial to the widespread adoption of HIT. U.S. physicians have been reluctant to adopt HIT primarily because they are concerned about lost productivity spent during training and inadequate financial incentives. Some researchers have estimated that start-up costs are $40,000 per physician in small group or solo practices.[19] To offset these increased costs, one suggestion is that public and private insurers pay physicians $5 per submission of an EHR.[20] This would cost Medicare an estimated $4 billion per year. Others have suggested that pay-for-performance systems should reward providers that have HIT systems. Studies have also suggested that some costs could be offset through im-

EXHIBIT 3
Efforts To Implement Health Information Technology (HIT) In Six Countries, 2003

	U.S.	Australia	Canada	Germany	Norway	U.K.
Committee	ONCHIT[a]	National Health Information Group[b]	Office of Health and the Information Highway[c]	German Institute of Medical Documentation and Information	Ministry for Health and Social Affairs, KITH[d]	NHS Connecting for Health[e]
Name of major initiative	–	HealthConnect	Canada Health Infoway	Better IT for Better Health	More Health for Each bIT Say @h! Te@mwork 2007	National Programme for IT
Initial year of national IT effort	2006	2000	1997	1993	1997	2002
Expected year of complete implementation	2016	Undefined	50% by 2009	2006	2007	2014
Providers participating in EHR	Hospitals, physicians, pharmacists, labs, group practices, SNFs, home health clinics, FQHCs, health care clinics, IHS clinics, rural health clinics	Hospitals/ ERs, GPs, specialists, nurses, pharmacists, labs, psychiatrists, nursing homes, optometrists	Hospitals, GPs, specialists, nurses, pharmacists, labs	Hospitals/clinics, GPs, specialists, nurses, pharmacists, labs, dentists, insurance companies	Hospitals, GPs, specialists, nurses, pharmacists, labs, therapists, institutions for elderly and disabled	Hospitals, GPs, specialists, nurses, pharmacists, labs, dentists
Type of technology used	EHRs, PHRs, telehealth, health information network	EHRs, point-to-point messaging	EHRs	Smart health card	EHRs, Norwegian Health Net	Integrated care record service, electronic appointments, electronic prescription transmission, infrastructure/ network
Estimate of total investment (as of 2005)[f]	$125M U.S.	$97.9M U.S.	$1.0B U.S.	$1.8B U.S.	$52.2M U.S.	$11.5B U.S.
Total investment per capita (as of 2005)[g]	$0.43	$4.93	$31.85	$21.20	$11.43	$192.79

SOURCES: See below.

NOTES: ER is emergency room. GP is general practitioner. SNF is skilled nursing facility. FQHC is federally qualified health center. IHS is Indian Health Service. EHR is electronic health record. PHR is personal health record.

[a] Office of the National Coordinator for Health Information Technology, U.S. Department of Health and Human Services.

[b] Within the Australian Health Ministers Council and through the National Implementation Steering Committee.

[c] Canada Health Infoway Inc.

[d] Directorate for Health and Social Affairs.

[e] National Health Service.

[f] Exchange rates as of September 2005: $1 U.S. = $1.31 AUS; $1.19 CAN; $0.80 EURO; $6.21 NOR; $0.54 U.K.

[g] Per capita is based on 2003 population numbers from the Organization for Economic Cooperation and Development (OECD).

proved billing and coding.[21]

■ **Ways to increase physicians' participation.** Because of the importance of in-

volving physicians, countries have adopted various approaches to increase physicians' participation. For example, Norway encouraged adoption through federal contributions to regional projects proposed by specific providers. Conferences and seminars were also conducted to inform and educate providers to ease the transition to an electronic system.

England and Australia both encouraged implementation by identifying early adopters and using them to convince their colleagues of HIT's potential value.[22] The two countries also designed campaigns that addressed physicians' questions. For example, the HealthConnect campaign in Australia focused on clearly outlining the legal issues of participation, creating an easy step-by-step registration process, and defining and addressing the capabilities providers need to effectively participate.

Barriers To HIT Adoption

One reason that countries abroad did not experience the same level of fragmentation in HIT adoption that the United States has experienced is that they have relatively simple health insurance contract payment structures, with standard nomenclatures that are easily operated electronically.[23] Australia, Canada, Germany, Norway, and the United Kingdom all began with fragmented and incremental processes, but over time, they realized the need for national HIT standards.[24] These countries found that national efforts have the advantage of ensuring uniform privacy and confidentiality standards, guiding efficient development and implementation of technology, and providing grants and incentive programs to encourage HIT adoption.

■ **Lack of interoperability.** Some countries have found that one danger of a fragmented approach to HIT implementation is a lack of interoperability among various HIT systems. This is particularly important for the management of people with multiple chronic conditions, whose care is often managed by multiple providers.[25]

Germany and Norway have built their HIT programs using the standards of interoperability and privacy set by the eEurope 2002 and eEurope 2005 Action Plans.[26] Their visions were to prepare their HIT systems for future levels of interconnectivity in electronic commerce, particularly for pharmaceuticals.[27] A longer-term goal is to allow all clinicians in Europe to be able to access health records from all countries.

In June 2005, the U.S. Department of Health and Human Services (HHS) formed the American Health Information Community to develop common standards and interoperability while ensuring privacy and confidentiality. At the request of HHS, Health Level Seven (HL7) interoperability standards are being adopted for clinical and administrative data on various computer systems to communicate while preserving meaning.[28] Canada, Germany, the United Kingdom, and to a limited extent Norway and Australia have adopted HL7 standards to promote interconnectivity. In addition, HHS signed a licensed agreement to stan-

dardize the Systemized Nomenclature of Medical and Clinical Terminology (SNOMED CT).

Germany's upgrade of its smart-card technology moves it toward the goal of portability.[29] The technology allows authorized health professionals to access a centralized database holding patient data within a secure network managed using public key infrastructure (PKI) technology.[30] The provider signs legally valid electronic documents to store data within a chip on the smart card and then encrypts the data to allow their secure transmission.[31] The new smart health card allows physicians to access networked databases that provide patients' complete medical histories.

■ **Privacy and confidentiality concerns.** The public's perception of the security of their personal health records is critical to HIT adoption. The U.S. Health Insurance Portability and Accountability Act (HIPAA) of 1996 has provisions establishing the privacy of health information, mandating steps toward the creation of standards for coding and the electronic transmission of medical claims. However, 70 percent of the U.S. population remains concerned that sensitive personal information could be leaked because of weak security.[32]

Each country engaged in HIT has developed or is in the process of developing privacy and confidentiality standards. Germany's health initiative divides information into two parts: an administrative part that is obligatory (for example, copayment status and paperless transmission prescriptions) and a medical part that is voluntary (for example, drug usage, current diagnoses, and previous surgeries). Germany's regulations allow patients to decide whether or not to release their medical part and which specific medical information to make available to whom.[33] Norway recently adopted laws regarding health professionals' handling of confidential and electronic health information, and laws enforcing the integrity and security of EHRs.[34] Canada developed a Pan-Canadian Health Information Privacy and Confidentiality Framework to suggest a set of core provisions for the collection, use, and disclosure of personal health information in both the publicly and privately funded sectors.[35] However, not all of the provinces have adopted the full framework.

■ **Direct and indirect costs.** The cost of HIT adoption is a major concern in all of the countries. This is also the most difficult component to compare because of the various scopes and types of programs and funding mechanisms. In addition, cost estimates are often revised as a project progresses.

Rainu Kaushal and colleagues estimate that to establish a national HIT network in the United States within five years, the largest costs will be $103 billion in capital costs and $53 billion in interoperability costs.[36] U.S. hospitals are expected to incur the highest functionality costs ($51 billion), followed by skilled nursing facilities ($31 billion) and office practices ($18 billion). Kaushal and colleagues advise public and private insurers to revise their payment policies to promote HIT adoption.

"Many countries have subsidized the application of HIT with public funds, on the condition that those systems can interconnect."

Australia's HealthConnect found that the largest costs over the first five years were for infrastructure deployment, change-management programs, and system integration.[37] Ongoing costs were shared among jurisdictions and private-sector partners.[38] Nevertheless, Australia does not envision a substantial role for the private sector as an investor in the first few years.[39] With an undefined completion date, Australia is aware that further efforts and funds will be necessary to fully establish a national HIT program.

The Canadian government shares costs with provinces and territories through a matching-funds program to support implementation. Canada funds up to 80 percent of ground-breaking projects because of the high risk and high initial investment.[40] The funding is scaled downward to 20 percent as the project becomes less risky. Canada funds only those programs that also meet federally agreed-upon standards.

Often, initial estimates of the total cost for HIT implementation have been too low. For example, the Canadian government originally provided funds of $420 million to Canada Health Infoway but now expects to spend to $1.2 billion. The original plan included only funds for researching solutions for IT use in health and did not incorporate the implementation phase. When the decision was made to implement, each of the provinces signed on to receive funds from the Canadian government.

The United Kingdom originally announced in 2002 that the NPfIT program would cost $4.3 billion over three years but later more than doubled its estimate and time frame to $10.8 billion over ten years.[41] The National Health Service (NHS) hopes to achieve a steady-state annual funding level of 4 percent of its total budget to go toward HIT programs, up from the current 1.5 percent.[42] The head of NPfIT, Richard Granger, insists that the money will come from already committed funds for HIT programs and that no extra money needs to be allocated, assuming that the overall NHS budget grows as projected.[43]

The Australian government has more than doubled its current investment in the development of EHRs. Although the current total spending level is less than $100 million, $1.1 billion in HIT-related projects are "on the drawing board."[44] Hospitals in Australia are struggling with operational issues that are forcing the federal government to keep funding minimal for HealthConnect until these issues are resolved. In addition, Australia works in partnership with states and territories, which will be investing sizable funds in HealthConnect. Norway and Germany have remained close to their original budgets.

Who Pays, And Who Benefits?

In all of the countries, the cost of implementing an HIT program is borne by the government or health insurers, or both. It is recognized in these countries that the benefits and cost savings accrue primarily to patients and insurers, not to providers. Economists recognize that use of IT in health care has a strong public-goods component, which means that a particular stakeholder often does not reap the full social benefits produced by new HIT investment. Consequently, according to economic theory, the private sector will underinvest in IT relative to its social benefits, which leads economists to recommend that public subsidies be used for the development of HIT systems, even though they will be used by private stakeholders. Also, the value of a particular HIT system installed by one stakeholder tends to increase with the number of other HIT systems installed elsewhere with which that stakeholder's HIT system can communicate. For these reasons, many industrialized countries have subsidized the application of HIT with public funds, albeit it on the condition that those HIT systems can interconnect. The United States has begun to do so in recent years as well, although so far on a much more modest scale.

THE UNITED STATES STILL HAS THE HIGHEST LEVEL of health spending in the world—currently almost two and a half times the level in the median OECD country. One suggestion for lowering health spending and improving health outcomes is the adoption of HIT. However, in all countries, we found no evidence that the savings from these initiatives have been rigorously evaluated. Nevertheless, many industrialized countries are proceeding to implement HIT because they are convinced that it both saves costs and improves quality.

A comparison with other industrialized countries suggests that the United States is beginning the implementation process as much as a dozen years behind these countries. The United States might be able to shorten the implementation phase if it can learn from these countries' experiences.

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NOTES

1. Spending is measured in purchasing power parities (PPPs), which adjust for cost-of-living differences between countries by comparing the price of an economywide market basket of goods.
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3. J.P. Newhouse, "Medical-Care Expenditure: A Cross-National Survey," *Journal of Human Resources* 12, no. 1 (1977): 115–125.
4. The regression equation is as follows: Health Spending per Capita = 0.0019 × (GDP per capita)1.3738. This simple bivariate equation has an R^2 of 0.9083. The equation suggests that a 10 percent increase in GDP per capita is associated with a 14.0 percent increase in per capita health spending. Inclusion of added variables in the equation might alter its estimated coefficients. Generally, other studies found that even when other variables are included, health spending rises at a greater proportion than increases in GDP. The regression equation including the United States and Luxembourg was as follows: Health Spending per Capita = 0.0043 × (GDP per capita)1.2943, $R^2 = 0.85$.
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13. The CMS National Health Expenditure Accounts separate spending by provider of services; the OECD categorizes health spending data by use of services.
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