Waste in the U.S. Health Care System: A Conceptual Framework

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Context: Health care costs in the United States are much higher than those in industrial countries with similar or better health system performance. Wasteful spending has many undesirable consequences that could be alleviated through waste reduction. This article proposes a conceptual framework to guide researchers and policymakers in evaluating waste, implementing waste-reduction strategies, and reducing the burden of unnecessary health care spending.

Methods: This article divides health care waste into administrative, operational, and clinical waste and provides an overview of each. It explains how researchers have used both high-level and sector- or procedure-specific comparisons to quantify such waste, and it discusses examples and challenges in both waste measurement and waste reduction.

Findings: Waste is caused by factors such as health insurance and medical uncertainties that encourage the production of inefficient and low-value services. Various efforts to reduce such waste have encountered challenges, such as the high costs of initial investment, unintended administrative complexities, and trade-offs among patients', payers', and providers' interests. While categorizing waste may help identify and measure general types and sources of waste, successful reduction strategies must integrate the administrative, operational, and clinical components of care, and proceed by identifying goals, changing systemic incentives, and making specific process improvements.

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Conclusions: Classifying, identifying, and measuring waste elucidate its causes, clarify systemic goals, and specify potential health care reforms that—by improving the market for health insurance and health care—will generate incentives for better efficiency and thus ultimately decrease waste in the U.S. health care system.

Keywords: Health care waste; health care inefficiency; quality of care; health care reform; administrative, operational, and clinical waste.

Health care costs in the United States now account for 16 percent of the country's gross domestic product, and per capita health care spending is approximately twice that of other major industrialized countries (OECD 2008). Given that the U.S. system's performance is no better than that of other countries, much of the money must be spent unnecessarily or wastefully (Commonwealth Fund 2008). Our immense spending makes health care and health insurance increasingly unaffordable, and furthermore, 45.7 million Americans have no health insurance (DeNavas-Walt et al. 2008). It also threatens the nation's ability to pay for new treatments and technologies, which often are expensive, and to make other discretionary expenditures. Current and looming health care–spending obligations prevent the federal government from achieving universal insurance coverage or other national goals outside the health care system while maintaining national fiscal health (Orszag and Ellis 2007a, 2007b).

Inefficiencies persist within the health care system because—in contrast to other economic sectors in which competition and other economic incentives act to reduce the level of waste—none of the health care system's players have strong incentives to economize. Although it is necessary for protection against the potentially catastrophic costs of treatment, generous health insurance coverage insulates patients from the true cost of medical care (Pauly 1969). Fee-for-service providers are paid for all services, whether or not they are necessary. Furthermore, because physicians advise patients on what care they need and also provide that care, they lack incentives to ration. Insurance and medical uncertainties muffle price competition and, in our litigious climate, promote overscreening and overtreatment. Health insurers, chastened by the backlash against managed care, act passively in reimbursing health

care spending and, as expenditures increase, merely pass costs along to purchasers in the form of higher premiums. The impact of these higher premiums on the insured is limited, however, owing to Medicare and other public insurance entitlements, as well as the tax subsidization of employer-sponsored health insurance. Together, all these factors allow inefficiency to thrive in the U.S. health care system.

Types of Waste

In order to help reduce waste in the U.S. health care system, we first must understand the sources of the problem. While many studies have examined different types of waste, there has been, to date, no comprehensive conceptual framework to guide researchers and policymakers in categorizing and developing specific strategies to address different types of waste. We propose such a framework in this article.

This framework builds on the traditional understanding of waste as a measure of inefficiency. Conceptually, economists distinguish between two types of inefficiencies: *productive inefficiencies*, which create waste in the form of excess costs in producing a given output, and *allocative inefficiencies*, which produce the wrong output. *Waste in production* is the difference between the cost of producing the item or service under the current system and the cost of producing it efficiently. *Waste in misallocated outputs* is the difference between the cost of the item or service and its actual value. While these types of inefficiencies differ in theory, they overlap significantly in reality. For example, additional imaging tests of low value to the patient could be considered a productive inefficiency, because the output (a diagnosis, in this case) could have been made with fewer tests and at lower cost. This case also represents an allocative inefficiency in that these imaging tests are of low value to the patient in question. Although waste might also be defined in terms of the morbidity and mortality resulting from substandard or no care, here we only consider financial waste.

Some of the great amount of spending in the United States is due to the high prices of medical goods and services, an issue that falls outside our conceptualization of waste. Insurance and market power are the main causes of overpayments for inputs but because economic resources are not being used up when the payer's loss is the producer's gain, economists consider them to be transfers and not waste. In any case, high U.S. prices

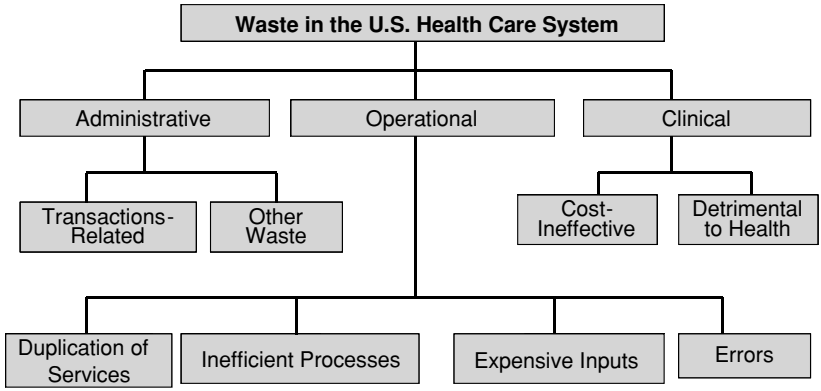

FIGURE 1. Waste Schematic

add greatly to the costs of care; create incentives for the oversupply of overpriced personnel, procedures, or drugs; and have consequences similar to those of waste, such as making insurance or other desirable programs less affordable (Anderson et al. 2003). To be fair, these excess profits may benefit the health care system by providing incentives for companies to develop new technologies and for students or doctors to acquire useful medical or surgical training.

In our framework, we discuss three types of waste—*administrative*, *operational*, and *clinical*. Both administrative and operational waste are components of inefficient production, and clinical waste is a form of allocative waste. *Administrative waste* is the excess administrative overhead that stems primarily from the complexity of the U.S. insurance and provider payment systems, and *operational waste* refers to other aspects of inefficient production processes. *Clinical waste* is waste created by the production of low-value outputs. Figure 1 shows the three components of waste and their subcomponents.

Road Map for the Remainder of This Article

In the following sections, we describe administrative, operational, and clinical waste and their subcomponents; review attempts to quantify waste in each area at both the higher and sector-specific levels; and

discuss examples, challenges, and unintended consequences of recent attempts to reduce each type of waste. We conclude with a discussion of general issues for waste reduction in the U.S. health care system.

To identify and quantify waste, we relied on two general strategies: (1) high-level comparisons of geographic differences in spending either within the United States or between the United States and other countries; and (2) sector- or procedure-specific evaluations of productive inefficiencies within a particular organization, or cost-effectiveness studies of medical interventions.

High-level comparisons can provide overall estimates of waste in the health care system and signal the need for change, but they do not pinpoint where the waste originates in the health care system. More-specific evaluations indicate promising areas for improvement after systemic changes have been made that encourage individuals and organizations to be more efficient.

Administrative Waste

Many health sector experts characterize the U.S. health care system as administratively wasteful and attribute this to the system's vast administrative complexity. Economist Henry Aaron described the system as "an administrative monstrosity, a truly bizarre mélange of thousands of payers with payment systems that differ for no socially beneficial reason, as well as staggeringly complex public systems with mind-boggling administered prices and other rules expressing distinctions that can only be regarded as weird" (Aaron 2003, p. 801).

Despite the general consensus on the existence of administrative waste, there is little consensus about what exactly constitutes administrative waste. Clearly, some administrative spending is valuable to the functioning of organizations within the health system and the system as a whole. We define *administrative waste* as any administrative spending that exceeds that necessary to achieve the overall goals of the organization or the system as a whole (GAO 1994). Even though this definition is somewhat abstract, we use it in our framework to identify and quantify administrative waste in the health care system as a whole and for the individual entities within it.

TABLE 1
Administrative Activities in the Health Care System

Function	Types of Activities
Transaction-related	Billing, claims processing
Benefits management	Insurance product design, verification of benefits
Sales/marketing	Producing, selling, or purchasing competitive products in the marketplace
Regulatory/compliance	Activities to comply with government and nongovernmental regulations and accreditation, e.g., licensing, OSHA, HIPAA compliance, JCAHO, NCQA

Overview of Administrative Activities

As our first step to describing administrative waste, we identified the activities in health care administration. Thorpe (1992) divided administrative activities into the functions outlined in table 1.

The activities within a particular function vary depending on the nature of the organization and its outputs. Thorpe argued that comparing the administrative costs among different organizations within a given sector can be misleading because these organizations may produce different products. For example, the products offered by health insurance companies may differ by the level of cost sharing, managed care, types of clients, or for-profit status. Thorpe further contended that differences in administrative costs do not automatically imply that one organization is necessarily more efficient than another, nor do these differences translate directly into a quantification of administrative waste.

Many administrative expenditures in the United States are due to its complex, fragmented multiple-payer health care system. In this system, health care delivery organizations interact with multiple payers, each of which has its own billing mechanisms and requirements. Thus, many administrative expenditures are related to billing and insurance-related (BIR) functions. BIR functions include any administrative activities intended to "move money from payer to provider in accordance with agreed-upon rules" (Kahn et al. 2005, p. 1630). Table 2 shows the proportion of administrative activities attributable to BIR in, respectively, private insurance companies, hospitals, and physicians' groups.

TABLE 2
Proportion of Administrative Costs Related to Billing and Insurance-Related (BIR) Functions

	BIR as % of Revenue	Administrative Costs as % of Revenue	BIR as % of Administrative Costs
Private insurance–commercial plans	8.4	9.9	84.8
Hospitals	6.6–10.8	20.9	31.6–51.7
Physicians' groups (multispecialty)	13.9	26.7	52

Source: Kahn et al. 2005.

International Comparisons of Administrative Waste

International comparisons can highlight differences among countries in levels of administrative spending. The Organisation for Economic Co-operation and Development (OECD) collects National Health Accounts (NHA) data for many countries, and comparisons show that the U.S. health system outspends other countries in the sum of private insurance expenditures plus public insurance administration (see figure 2) (Davis et al. 2007).

A key limitation of such comparisons is that accounting procedures in different countries may vary. Also, NHA data do not include administrative costs within hospitals or physicians' groups. This unmeasured administrative overhead is larger in a multiple-payer system, and so intercountry comparisons using these data actually *underestimate* administrative spending in the United States when compared with countries with less complex payer systems.

In recent years, researchers have compared health care spending in the United States and Canada in an attempt to quantify excess administrative costs in the United States. The two countries are culturally comparable, with health care systems that were similar before Canada's 1971 transition to a single-payer system. Table 3 lists studies of the expected cost savings if the United States were to change to a

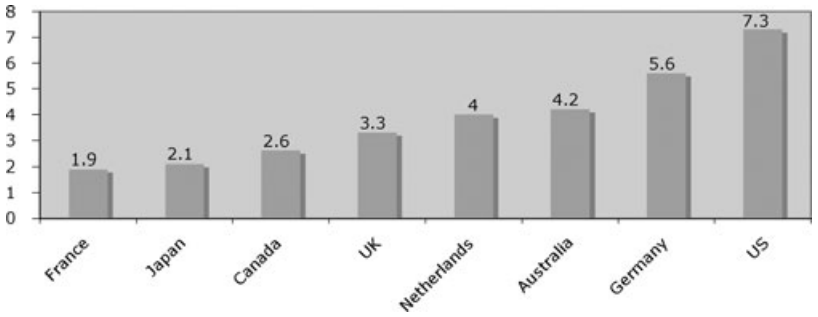

FIGURE 2. Percentages of National Health Expenditures Spent on Health Administration and Insurance

Source: Davis et al. 2007.

TABLE 3
Estimates of U.S. Health Care Administrative Savings from a Transition to a Canadian-Style Single-Payer System

Study	Administrative Cost Savings[a]
Woolhandler, Campbell, and Himmelstein 2003	$280.4 billion
Aaron 2003	$213.3 billion
GAO 1992	$127.1 billion
Sheils, Young, and Rubin 1992	$89.1 billion

Note: [a]Adjusted to US$2006 using the Medical Care Consumer Price Index, U.S. Bureau of Labor Statistics (http://www.bls.gov/cpi/).

single-payer system. Even though each study calculated these costs differently, all the studies concluded that the United States could save money on administration by implementing a Canadian-style single-payer health care system.

Critics of these studies note that the competition and choices found in a multiple-payer system may have value for patients that is not reflected in these comparisons (Pauly and Nichols 2002). Yet even assuming that a multiple-payer system would require higher administrative spending, it remains unclear how much value this extra spending would add to the U.S. health care system. For example, the competition and choice among a large number of drug insurance plans can actually reduce patients' comprehension and the quality of their decisions (Hanoch and

Rice 2006; Rice et al. 2002). Limited competition among private health insurers with a standard benefit package—as seen in some European countries—may benefit consumers by offering lower costs and higher quality and may not add greatly to administrative overhead (van de Ven and Schut 2008).

Sector-Specific Administrative Waste

Health Insurance. Some analysts contend that some of the spending by private health insurance companies is wasteful. Between 2000 and 2005, the administrative overhead for health insurance—the difference between premiums and claim payments—grew 12.0 percent per year, more than the average health expenditure growth of 8.6 percent (Davis et al. 2007). Administrative overhead represents approximately 14 percent of the total spending in private insurance but comprises only 3 to 5 percent of spending by public-sector programs such as Medicaid and Medicare (Caitlin et al. 2007; Davis et al. 2007; McKinsey Global Institute 2007).

This comparison between public and private, however, has been criticized on a number of fronts. First, since Medicare provides coverage for a population with higher health needs, its average per capita expenditure of $6,059 (2004) exceeds that of private health insurance at $2,700 (2003). Because the spending on Medicare beneficiaries is so high, the ratio of administrative costs to total expenditure appears lower than that in private insurance (Kaiser Family Foundation 2007; Matthews 2006). Second, Medicare does not face the same competitive markets as private insurance does and therefore does not need to spend money on marketing, a significant portion of such costs. Third, Medicare's overhead does not include costs for activities such as the taxation of workers to fund Medicare, whereas estimates of administrative costs for private insurance do include premium collection costs (Matthews 2006).

In addition to the contrast *between* private and public insurance, other studies suggest inefficiencies *within* both sectors. For example:

- Typically, 40 percent of total costs for individual or non–group health insurance policies are attributable to administrative activities, whereas for group policies this proportion ranges from 5.5 to 18 percent (Thorpe 1992). Some of these inefficiencies might be reduced through the use of pools to create economies

of scale for the purchase of individual health insurance policies (Merlis 2005).

- Financial pressures on public programs may lead to the creation of wasteful enrollment barriers for entitlement programs. In the face of budgetary shortfalls, some state Medicaid programs have imposed administrative hurdles to limit the number of Medicaid enrollees. Simplifying the application process, including shortening the application and limiting the number of documents necessary for enrollment, could reduce by 40 percent the administrative costs of enrolling a child in Medicaid (Fairbrother et al. 2004).
- Although the increase in electronic claims submissions has reduced costs, errors, and processing times, insurance companies still report that 29 percent of claims were received more than thirty days past the date of service (McKay and Lemak 2006).

Providers. Administrative waste among providers is made evident in the following examples:

- Compared with Canada, the United States has a higher number of administrative hospital personnel per capita, even though the numbers of physicians and nurses per capita are roughly the same (Office of Technology Assessment 1994).
- In their interactions with multiple payers, practitioners and hospitals are encumbered by numerous billing requirements, a multitude of formularies and clinical care guidelines, and patients with different covered benefits. Simplifying the product design and the insurance verification processes could save time and money (Medical Group Management Association 2005).
- The contracts between medical groups and hospitals and these multiple payers must be separately negotiated and renewed usually annually. Estimates suggest that medical groups alone incur costs of $700 million per year to negotiate these contracts (Medical Group Management Association 2005).
- Physicians must fill out numerous credentialing applications for hospitals and plans each year. A standard, universal credentialing form was estimated to save 91 percent of providers' administrative costs in completing these forms (Schoenbaum 2006).

Challenges of Administrative Waste Reduction. The 1997 Health Insurance Portability and Accountability Act (HIPAA) included several

provisions related to administrative simplification. Specifically, it was intended to streamline the interaction between payers and providers by introducing a single standardized form for claims submission, determination of claim status, and verification of eligibility and benefits.

Although this legislation promised to simplify the billing and insurance functions within the health care industry, several related issues have prevented it from succeeding. First, compliance with HIPAA has required that providers and payers make larger than expected investments in the technology needed to support these electronic transactions. Second, this legislation has inadvertently expanded the number of instruction guides used by providers and payers. Before HIPAA, there were more than 400 separate claim forms for different insurance companies. While HIPAA reduced this to a single form, each insurance company had different data needs and thus each published its own instruction guides. There are now more than 1,000 payer companion guides—up to 600 pages in length—to help providers fill out the single claims form. In addition, because provider groups' practice management systems do not always support all the potential transactions mandated by HIPAA, their practices are not always able to take advantage of useful electronic transactions, such as eligibility verification (NCVHS 2005). Finally, some providers are not yet able to transmit claims in the proper format, so they use billing clearinghouses, thus adding a layer of complexity in transactions while not consistently producing savings (Terry 2004).

Operational Waste

The health care system produces and delivers health care services and episodes of care to individuals with the primary goal of improving health. *Operational waste* refers to the inefficient and unnecessary use of resources in the production and delivery of such services and can be divided into four types, as shown in table 4 (Bush 2007; Womack et al. 2005; Womack and Jones 2003).

The inefficient production of services imposes unnecessary financial and nonfinancial burdens on all elements of the health care system. For example, errors caused by poor handwriting can lead to morbidity and mortality in patients, additional time costs for providers in clarifying orders, and costs to payers for additional procedures or care for the

TABLE 4
Typology of Operational Waste

Type of Waste	Description	Health Care Examples
Duplication of services	Producing unnecessary repeated services	Tests or procedures done more frequently than clinically necessary
Inefficient processes	Poor process design that causes unnecessary movement or inventory in the production of services	Time spent waiting; unnecessary transport of people or material; useless motions; multiple stock items due to lost or misplaced supplies
Overly expensive inputs	Producing services with expensive equipment or personnel when less expensive inputs would suffice	Physicians providing services for which nurses are equally competent; use of brand drugs for patients who get equal benefit from generics
Errors	Quality defects that result in rework or scrapping	Defective medical devices; rework of tests or procedures; health and cost consequences of medical errors

Source: Adapted from Bush 2007.

morbidity resulting from these errors. The Institute of Medicine has estimated that preventable medical errors claim between 44,000 and 98,000 lives in hospitals each year (Institute of Medicine 1999). Wasted patient time can also lead to less satisfaction and even lost wages for patients. Overly expensive inputs are similarly wasteful when expensive resources are used when cheaper ones would suffice.

International Comparisons of Operational Waste

Comparisons of spending across countries offer insight into possible operational waste. Among comparable OECD countries, the United States spends the most on health care, both per capita and as a

percentage of GDP, but has the lowest life expectancies and is no better on other measures of health system performance (OECD 2008). A recent study comparing the quality of care in Australia, Canada, New Zealand, England, and the United States found that each country had at least one area in which it performed the best and at least one in which it performed the worst (Hussey et al. 2004). These results echo the finding of the 2008 National Scorecard on U.S. Health System Performance that the United States consistently lags behind other industrialized countries in terms of healthy lives, care experiences, and efficiency (Commonwealth Fund 2008). In particular, the United States performed the worst among nineteen industrialized nations at preventing deaths "amenable to health care" (Nolte and McKee 2008).

Evidence that the quality of care in the United States is no better than that of other industrialized nations raises the question of what the higher spending is buying and points to operational waste in the system. Although clinical waste and higher prices also contribute to overall health care waste in the United States, inefficient production processes are likely to play a major role in driving health spending disparities between the United States and other industrialized nations with a similar overall quality of performance. For example, medical errors—which can indicate inefficient processes—are estimated to cost between $17 billion and $29 billion annually in the United States, compared with an estimated $750 million per year in Canada (Bond, Raehl, and Franke 2001; Johnson et al. 1992; Kondro 2004; Thomas et al. 1999).

Sector-Specific Operational Waste

Efforts to identify and quantify specific sources of operational waste have focused on interventions to reduce levels of waste in both specific health care systems and processes of care. We found one example of each type of intervention.

"Lean Thinking." Virginia Mason (VM) Medical Center in Seattle has produced care more efficiently with "lean-thinking" methods (Bush 2007; Pham et al. 2007; Weber 2006), in which efficiency measures are applied to all the goods and services needed to complete an episode of patient care. For example, VM reduced the duplication of services by improving its use of information technology, reorganizing physicians' stations, and implementing multidisciplinary bedside rounds. VM reduced its inefficient production of care by cutting waiting and transport

TABLE 5
HIT-Enabled Savings in Operational Waste

	Yearly Savings at 100% Adoption ($ in Billions)	Yearly Medicare Savings at 100% Adoption ($ in Billions)
Outpatient		
Transcription	1.9	0.4
Chart pulls	1.7	0.3
Laboratory tests	2.2	0.5
Drug utilization	12.9	2.6
Radiology	3.6	0.7
Total outpatient	22.3	4.5
Inpatient		
Nurse shortage	12.7	3.9
Laboratory tests	3	0.9
Drug utilization	3.7	1.1
Length of stay	36.7	11.3
Medical records	2.5	0.8
Total inpatient	58.6	18
Total outpatient and inpatient	$80.9	$22.5

Source: Girosi, Meili, and Scoville 2005.

time for patients and maintaining only frequently used instruments in operating rooms. Generics replaced brand-name drugs when possible without affecting the quality of care, and computerized clinician order entry and patient safety alerts reduced errors and defects.

Preliminary assessments have estimated that the annual savings to VM payers from cutting the process costs associated with back pain, migraine headaches, and cardiac testing is at least $190,000 and may be as high as $2.6 million (Pham et al. 2007).

Health Information Technology. Health Information Technology (HIT) may also be able to transform the provision of health care (Hillestad et al. 2005), and this could have significant policy implications (Taylor et al. 2005). In 2005, Girosi and colleagues quantified the potential national-level implementation costs and efficiency savings by the widespread (up to 100 percent) adoption of HIT in the U.S. health care system. The researchers looked specifically at the operational savings that could be realized through HIT if care could be provided with fewer resources. Savings were categorized into ten different sources in the inpatient and outpatient health-care sectors. Table 5 shows the estimated potential

yearly savings by adopting HIT at 100 percent, both for the U.S. health care system overall and for Medicare specifically.

With the 100 percent adoption of HIT, annual efficiency savings were projected at more than $80 billion, and the predicted cumulative net benefits by year 15 were $370 billion for inpatient and $142 billion for outpatient settings. The benefits of HIT adoption far outweighed its costs, with mean annual benefits estimated at $40 billion and mean annual costs—after initial investments—at $7.6 billion.

Challenges of Operational Waste Reduction

While it may be easy to find specific mechanisms of operational waste, the multiple combinations of personnel, equipment, patients, and performance that make up each episode of care result in seemingly infinite opportunities for inefficient production. Thus, evaluating—or attempting to achieve—the goal of performing the same tasks with fewer resources depends on how we classify these various production inputs. We could consider efficiency improvements at the level of *specific resources*—such as by reducing the amount of money, time, or personnel required—or the level of *resource allocation*—such as by implementing HIT, replacing licensed practical nurses with physician assistants, or rerouting patient flow. Or we could categorize waste by the comprehensive clinical *service*, such as chronic disease management or heart disease treatment, by diagnostic and treatment *procedures* such as imaging or surgery, by discrete *patient visits*, or by the distribution of *costs and benefits*.

One obstacle to operational waste reduction is its potential negative revenue impact on providers. As described earlier, Virginia Mason (VM) Medical Center in Seattle has made great strides in improving the production and delivery of their health care services (Bush 2007; Pham et al. 2007; Weber 2006). In achieving such cost and quality benchmarks, however, VM has encountered a fundamental challenge: while its specific efficiency improvements benefit *payers*, the consequential reduction in wasted resources risks the loss of *providers*. If VM provides care more efficiently and reduces hospital stays, for example, it may receive lower reimbursement from payers that pay on a per-diem basis. Also, shifting service volume from more-profitable to less-profitable services—such as from MRIs to physical therapy for back pain—is likely to hurt VM's profit margins (Pham et al. 2007). Because data on these

process improvements are limited and often proprietary, and because of the continuously evolving nature of such changes, it is not clear how improvements in operational processes will affect VM's overall financial viability. Nonetheless, the outcome will have important implications for how likely other health care providers are to follow VM's example in instituting similar operational efficiency improvements. For these types of operational efficiencies to be widely adopted, both the provider and payer would have to share in the financial benefits.

Clinical Waste

We define *clinical waste* as spending to produce services that provide marginal or no health benefit over less costly alternatives. Wasteful services include those that have detrimental health effects, or small positive health effects, compared with less costly alternatives. When the cost of a service exceeds its value, the less costly alternative may be to do nothing. There is considerable overlap, however, between clinical waste, or providing the wrong service, and *operational waste*, or the inefficient production of services. For example, the overuse of diagnostic tests might be due to operational inefficiencies such as lost medical records or to the clinically inefficient use of these tests. To avoid double counting, we restrict our definition of clinical waste to the production of low-value services.

Several factors in the health care system contribute to clinical waste. Waste can result from the uncertainty in the science of medicine, when the diagnosis is unknown and each clinical interaction may result in different care decisions. This may lead to "treatment creep," the provision of health care services that, though beneficial to some patients, are of low or no value to others. However, neither insured patients nor providers who are paid for their services have much incentive to avoid care of only marginal benefit, such as overscreening, an excessive number of follow-up visits, or the use of expensive branded drugs instead of equivalent generics.

High-Level Clinical Waste

A country or region that spends much more than another but does not have better health outcomes must be producing services that provide little marginal benefit over less costly alternatives. The international

comparisons of health care spending and health outcomes discussed for operational waste indicate that in the United States, inefficient decisions must be widespread in the clinical area as well.

An examination of specific services provided in the United States compared with Britain provides some details. In Britain, the National Institute for Health and Clinical Excellence (NICE) decides which drugs and procedures for which populations will be covered by the National Health Service (NHS). To make this determination, NICE uses cost-effectiveness analyses (CEA) with an approximate threshold of £30,000 per life year gained. Covered services are then provided free of charge to British citizens who qualify for them. In practice, many drugs and procedures are approved, but they are limited—using the predetermined threshold—to those populations to which they are considered most beneficial.

This model of rationing care means that some people will not receive potentially beneficial treatments if this benefit is marginal compared with its cost. For example, NPR recently highlighted a story of a man with terminal lung cancer who received years of free treatment from the British government. When a promising new cancer drug emerged, however, he was unable to receive it because it was too costly relative to its benefits (Silberner 2008). This type of decision is necessary in a system built on "social solidarity," with obligations to provide care to all citizens on a limited budget. Other examples of care that is provided less frequently in Britain (compared with the United States) include dialysis (75 percent lower than the United States in 2000) and coronary artery surgery (77 percent lower than the United States in 2002) (Aaron and Schwartz 2005). These examples illustrate a health system that provides basic health care for all and controls costs by restricting care of limited value. The United States has no comparable process for restricting care of marginal value, much of which is clinical waste. For example, one study found that despite our higher spending, U.S. adults are less healthy than those in Britain (Banks et al. 2006).

There also is considerable geographic variation in the quantity and type of care delivered to patients in the United States, with no apparent health benefits. For example, Fisher and colleagues compared regional differences in per capita spending on Medicare beneficiaries for particular conditions (Fisher et al. 2003a, 2003b). They found that patients in higher-cost regions used greater quantities of physicians' and hospital services than did those in lower-cost regions but had the same level

of health outcomes, quality, access, and patient satisfaction. Similarly, Wennberg and colleagues' analyses of Medicare claims data for people with terminal illness showed that much higher spending and intensity of care did not always improve survival or quality of care, even at the most renowned teaching hospitals (Wennberg et al. 2004).

Procedure-Specific Clinical Waste

To further illustrate and quantify specific sources of clinical waste, we calculated wasteful clinical spending as the total cost and percent of national health spending for eight "wasteful" clinical procedures (table 6), for which expected or actual annual wasted spending was at least $1 billion (an arbitrarily chosen cutoff value). We selected the procedures from reviews of the waste, efficiency, quality-of-care, and cost-effectiveness literature; from available cost and utilization data; and through structured interviews with clinical experts. The experts were chosen in those medical fields that were indicated by the literature as potentially generating large amounts of waste (e.g., radiology, heart disease, back pain). For each procedure, we obtained estimates of cost from the literature and data analysis, and we limited these estimates to direct clinical spending, utilization, and degree of waste. We quantified waste as the total spending for each procedure, multiplied by the proportion of unnecessary procedures, minus the costs of potential alternative "efficient" procedures.

The waste arising from specific medical treatments and procedures cannot simply be reduced to their direct medical costs, because any episode must be considered in its totality. For example, asthma programs may improve health and lead to fewer "preventable" hospitalizations, but the potential savings are reduced by the costs to the system and to patients of achieving those modifications. In contrast, our estimates may underestimate clinical waste by omitting the unintended consequences of clinical services, such as the longer-term development of antibiotic resistance from overprescribing antibiotics. Also, it can be difficult to identify the "best" alternative, that is, the most efficient way to produce care across the entire clinical episode, because attempts to reduce costs in one area may increase costs elsewhere. For example, in patients presenting to a cardiac catheterization lab, angioplasty and placement of a stent without prior imaging to identify the site of the obstruction could

TABLE 6
Estimates of Wasted Clinical Spending in the United States

Clinical Service	Total Annual Dollars ($ in Millions) Wasted	% of U.S. Health Care Spending	References and Sources Data
Excessive antibiotic use for viral upper respiratory infections and otitis media	$525–$546[a]	0.03	Capra et al. 2000; Gonzalez, Steiner, and Sande 1997; Kaplan, Wandstrat, and Cunningham 1997; Subcommittee on Management of Acute Otitis 2004
Avoidable emergency department use	$3,000 (upper bound)	0.16	Calculations from MEPS[b] 2004 data
Avoidable hospitalizations of nursing-home patients	$7,500 (upper bound)	0.4	Calculations from MCBS[c] 2003 data
Overuse of cytology for cervical cancer screening	$630 – $4,000	0.03–0.21	American Cancer Society 2007; Kim,Wright, and Goldie 2002; Solomon, Breen, and McNeel 2007
Inappropriate hysterectomies	$1,119	0.06	Broder et al. 2000; Farquhar and Steiner 2002; Hurskainen et al. 2004
Unnecessary hospital admissions in ED triage of chest-pain patients	$4,443	0.23	Gaspoz et al. 1994; Kontos et al. 2003; Society of Chest Pain Centers 2007

Continued

TABLE 6
Continued

Clinical Service	Total Annual Dollars ($ in Millions) Wasted	% of U.S. Health Care Spending	References and Sources Data
Overuse of noninvasive radiologic imaging	$18,210–$33,333	0.96–1.75	Baker 2003; Levin and Rao 2004; Rothenberg and Korn 2005
Inappropriate spinal-fusion surgeries	$11,118	0.59	Deyo 2007; Deyo et al. 2005; Deyo, Nachemson, and Mirza 2004; Grob, Humke, and Dvorak 1995; Katz et al. 1997; Kuntz et al. 2000; Malter and Weinstein 1996
Total	$36,044–$65,099	1.90–3.42	

Notes: [a]Millions of dollars and adjusted to 2006 US$. Estimates reflect percentage of waste estimates derived from literature, and ranges indicate upper and lower bounds. Population estimates standardized to the 2006 U.S. population.
[b]MEPS (Medical Expenditure Panel Survey).
[c]MCBS (Medical Current Beneficiary Survey).

be considered wasteful in that some people who do not need a stent will receive one. Nonetheless, the value of prior imaging varies among different patients, and the costs of additional stents are relatively low, so in some cases it might be less wasteful to place the stent *without* prior imaging.

The costs of the wasteful clinical procedures listed in the table add up to only 2 to 3 percent of total spending on U.S. health care. This suggests that despite the impression that 30 percent of U.S. spending may be wasteful (Sack 2008), it is difficult to identify clinical procedures that are *unambiguously* wasteful. The low total is partly due to the fact that our list is far from exhaustive, as well as our counting of only direct medical costs. In addition, quantifying the waste generated by any specific procedure is further complicated by the difficulty of identifying patients for whom a procedure is necessary, compared with those for whom it would be wasteful.

Challenges of Clinical Waste Reduction

The use of medical guidelines is one possible way to reduce clinical waste. Specifically, clinical care and its costs vary dramatically across geographic regions, even after correcting for health status (Fisher et al. 2003a, 2003b; Wennberg et al. 2004). Such variation has led many researchers to propose an increased use of clinical guidelines in order to standardize care using evidence-based medicine and comparative effectiveness data. Clinical guidelines, however, have several limitations. First, because their research basis may not be able to account for many patient characteristics, they may provide appropriate guidelines for the "average" patient, as opposed to all patients. In addition, when the treatment for a given disease is uncertain, different clinicians and policymakers may arrive at different conclusions for the best treatment. Finally, while the expertise of medical specialists is invaluable in formulating clinical guidelines, these specialists may ultimately gain financially from these proposed recommendations. Clinical guidelines, therefore, may not necessarily lead to the most efficient care for patients.

In addition, the widespread adoption of clinical guidelines may contribute to the phenomenon of preventive "treatment creep," through which patients with "pre-disease" are being treated with less than clear benefit. Preventive care has a popular reputation for saving money, but decades of research show that in most cases, it does not do so (Cohen,

Neumann, and Weinstein 2008). One example of potentially wasteful clinical guidelines are recommendations for the treatment of blood pressure levels that were previously considered normal. Kaplan and Ong estimated that changing the diagnostic threshold for hypertension—from 160/95 to 140/90 systolic/diastolic mm Hg—has led to more than 13 million new cases, and incorporating the new definition of prehypertension (systolic BP of 120–139 mm Hg or a diastolic BP of 80–89 mm Hg) would include up to 60 percent of the population and 90 percent of adults aged sixty and older (Kaplan and Ong 2007).

Discussion: Next Steps in Reducing Waste

Waste in the U.S. health care system contributes to the high cost of medical care and deflects resources from other desirable societal goals. The purpose of this article is to define health care waste, provide a conceptual framework for its classification, and describe what is known about different types of waste and the challenges in reducing them. Our discussion has shown both the difficulty in pinpointing wasteful spending and the complex interactions among different causes. Major changes will not come until the various organizations and individuals in the health care system are given not only clear incentives to reduce waste but also the systems, knowledge, and means to do so.

Misaligned incentives in the U.S. health care system inadvertently contribute to the problem: wasteful spending often augments the income of individuals or organizations, and payment rules can distort how and what health care is delivered. To change these incentives, the United States needs a variety of reforms to promote the efficient production, administration, and provision of health care services. Policy proposals in financing or quality improvement could improve the market for health insurance and health care and thereby generate incentives for better efficiency. The interests of the powerful players who profit from the waste in the current system complicate the politics of waste reduction, and so it has proved to be remarkably difficult to achieve the major health reforms that would be needed to make such system-wide changes. For example, economists have been arguing futilely for more than thirty years about the need to limit tax exemptions for employer-provided insurance, yet this reform is minor compared with others such as proposals to provide universal insurance coverage. Despite such challenges, only a

system-level and integrated approach can allocate resources efficiently by aligning incentives, guidelines, and processes of care with high-quality clinical care.

Even when people have an incentive to reduce waste, they need the knowledge and tools to do so. Waste will not change unless behaviors change, and facilitating this change will require major investments in equipment and training. Successfully implementing HIT, for example, could reduce operational waste but will require significant up-front investments. Included in such implementation costs are the education, training, and work-based assessments that underlie behavior change. Providers must be taught and given practice in finding and maintaining better methods, beginning with their academic education. These training costs include not only financial expenses but also the opportunity costs of time spent training rather than providing care.

Some reforms might be aimed at lowering high U.S. health care prices. For example, government payers might pursue competitive pricing or use current or enhanced governmental buying power more aggressively to reduce the prices paid for drugs or hospital or physicians' services. Lower prices would reduce governmental expenditures on currently covered health care, freeing up resources for other goals, but could be expected to reduce drug innovation and the quality and quantity of medical personnel and services. Other countries with much lower prices than ours have produced good health outcomes and satisfaction, but it is not clear how major price reductions would play out in the American context (Reinhardt, Hussey, and Anderson 2004).

As efforts to improve efficiency and decrease waste in the U.S. health care system continue, issues related to societal goals and preferences may emerge. For example, in trying to reduce clinical waste, varying definitions of "health" can yield alternative strategies for paying for care. Health can be defined narrowly, to include only mortality and physical and mental functioning, or broadly, to include other dimensions such as personal satisfaction and quality of life. If health is very broadly defined to include beauty, sexual fulfillment, and happiness, health insurance might cover orthodontia, plastic surgery, and quality-of-life drugs. Health insurance might also cover care that substitutes for a healthy lifestyle, such as pills for high cholesterol that people can take rather than exercising and eating a healthful diet. This broad definition of health would make health care exceedingly expensive. Restricting insurance coverage to only those health services implied by a narrow

definition of health would result in the decreased utilization of these other services because those individuals who desire them will have to pay their full price.

Waste reduction strategies can also facilitate the goal of social justice, whereby every individual has access to the medical care he or she needs and adequate insurance coverage to make it affordable. To ensure universal coverage with limited resources, we as consumers and providers of care must decide what basic package of medical care should be available to every individual. Any feasible plan to provide universal yet affordable coverage must be based on a narrow definition of health and incorporate the full range of other waste reduction strategies.

Given limited health care resources, cost-effectiveness analysis (CEA) can be a useful tool in allocating resources in order to get the most value for the money spent. As yet, there has been considerable resistance to the explicit consideration of cost and value to inform health care–spending decisions in the United States because such analyses can be interpreted as leading to the rationing of care (Neumann 2004; Neumann, Rosen, and Weinstein 2005). Nonetheless, many consider the use of CEA to be part of a comprehensive strategy to reduce wasteful spending at many levels.

Still, there may be instances in which other societal goals override basic CEA considerations of cost and value. For example, as a society, we may prefer to provide care to the sickest, most vulnerable patients, even though our money could buy greater improvements in life span or quality of life if used for another purpose (Nord 1999). Consideration of goals in such situations can help reduce waste. For example, we may decide that our goal in terminal care is to provide a caring and comfortable end to life. This goal does not require the provision of all care that might extend life; we need to recognize when care is futile or unsupported by evidence and that giving such care is not only wasteful but unethical as well.

The Institute of Medicine's Quality Chasm report found enormous amounts of waste in the U.S. health care system but also noted that the system has many other problems besides wasted resources (Institute of Medicine 2001). For example, one study found that American adults receive 55 percent of recommended care (McGlynn et al. 2003). The cost and health benefits of policies to address both this underuse of recommended care and quality of care generally remain unknown, but they undoubtedly will also affect waste. Policy proposals such as

developing national goals for quality improvement and implementing a system of quality measurement, quality reporting, and evidence-based clinical decision-making could improve the market for health insurance and health care and thereby generate incentives for better efficiency.

References

Aaron, H.J. 2003. The Costs of Health Care Administration in the United States and Canada— Questionable Answers to a Questionable Question. *New England Journal of Medicine* 349:801–3.

Aaron, H.J., and W.B. Schwartz. 2005. *Can We Say No? The Challenge of Rationing Health Care.* Washington, D.C.: Brookings Institution Press.

American Cancer Society. 2007. *American Cancer Society Guidelines for the Early Detection of Cancer*. American Cancer Society. Available at http://www.cancer.org/docroot/PED/content/PED_2_3X_ACS_Cancer_Detection_Guidelines_36.asp (accessed September 11, 2008).

Anderson, G.F., U.E. Reinhardt, P.S. Hussey, and V. Etrosyan. 2003. It's the Prices Stupid: Why the United States Is So Different from Other Countries. *Health Affairs* 22:89–104.

Baker, S.R. 2003. Abdominal CT Screening: Inflated Promises, Serious Concerns. *American Journal of Roentgenology* 180(1):27–30.

Banks, J., M. Marmot, Z. Oldfield, and J.P. Smith. 2006. Disease and Disadvantage in the United States and in England. *Journal of the American Medical Association* 295:2037–45.

Bond, C., C. Raehl, and T. Franke. 2001. Medication Errors in United States Hospitals. *Pharmacotherapy* 21:1023–36.

Broder, M.S., D.E. Kanouse, B.S. Mittman, and S.J. Bernstein. 2000. The Appropriateness of Recommendations for Hysterectomy. *Obstetrics and Gynecology* 95:199–205.

Bush, R.W. 2007. Reducing Waste in US Healthcare Systems. *Journal of the American Medical Association* 297(8):871–74.

Caitlin, A, C. Cowan, S. Heffler, B. Washington, and the National Health Expenditures Accounts Team. 2007. National Health Spending in 2005: The Slowdown Continues. *Health Affairs* 26(1):142–53.

Capra, A.M., T.A. Lieu, S.B. Black, H.R. Shinefield, K.E. Martin, and J.O. Klein. 2000. Costs of Otitis Media in a Managed Care Population. *Pediatric Infectious Disease Journal* 19:354–55.

Cohen, J.T., P.J. Neumann, and M.C. Weinstein. 2008. Does Preventive Care Save Money? Health Economics and the Presidential Candidates. *New England Journal of Medicine* 358:661–63.

Commonwealth Fund. 2008. *Why Not the Best? Results from the National Scorecard on U.S. Health System Performance, 2008*. Commonwealth Fund Commission on a High Performance Health System. Available at http://www.commonwealthfund.org/usr_doc/Why_Not_the_Best_national_scorecard_2008.pdf?section=4039 (accessed September 11, 2008).

Davis, K., C. Schoen, S. Guterman, T. Shih, S.C. Schoenbaum, and I. Weinbaum. 2007. *Slowing the Growth of US Health Care Expenditures: What Are the Options?* Commonwealth Fund, January.

DeNavas-Walt, C., B.D. Proctor, J.C. Smith, and U.S. Census Bureau. 2008. *Income, Poverty, and Health Insurance Coverage in the United States: 2007*. Current Population Reports, P60-235. Washington, D.C.: U.S. Government Printing Office.

Deyo, R.A. 2007. Back Surgery—Who Needs It? *New England Journal of Medicine* 356:2239–43.

Deyo, R.A., D.T. Gray, W. Kreuter, S. Mirza, and B.I. Martin. 2005. United States Trends in Lumbar Fusion Surgery for Degenerative Conditions. *Spine*, June 15, 1441–45.

Deyo, R.A., A. Nachemson, and S.K. Mirza. 2004. Spinal-Fusion Surgery—The Case for Restraint. *New England Journal of Medicine*, February 12, 722–26.

Fairbrother, G., M.J. Dutton, D. Bachrach, K. Newell, P. Boozang, and R. Cooper. 2004. Costs of Enrolling Children in Medicaid and SCHIP. *Health Affairs* 23(1):237–43.

Farquhar, C.M., and C.A. Steiner. 2002. Hysterectomy Rates in the United States 1990–1997. *Obstetrics and Gynecology*, February, 229–34.

Fisher, E.S., D.E. Wennberg, T.A. Stukel, D.J. Gottlieb, F.L. Lucas, and E.L. Pinder. 2003a. The Implications of Regional Variations in Medicare Spending. Part 1: The Content, Quality, and Accessibility of Care. *Annals of Internal Medicine*, February 18, 273–87.

Fisher, E.S., D.E. Wennberg, T.A. Stukel, D.J. Gottlieb, F.L. Lucas, and E.L. Pinder. 2003b. The Implications of Regional Variations in Medicare Spending. Part 2: Health Outcomes and Satisfaction with Care. *Annals of Internal Medicine*, February 18, 288–98.

Gaspoz, J.M., T.H. Lee, M.C. Weinstein, E.F. Cook, P. Goldman, A.L. Komaroff, and L. Goldman. 1994. Cost-Effectiveness of a New Short-Stay Unit to "Rule Out" Acute Myocardial Infarction in Low Risk Patients. *Journal of the American College of Cardiology* 24:1249–59.

General Accounting Office (GAO). 1992. *Canadian Health Insurance: Estimating the Costs and Savings for the United States*. Report GAO/HRD-92–93. April.

General Accounting Office (GAO). 1994. *Health Care Reform: Proposals Have Potential to Reduce Administrative Costs*. May.

Girosi, F., R. Meili, and R. Scoville. 2005. *Extrapolating Evidence of Health Information Technology Savings and Costs*. Santa Monica, Calif.: RAND Corporation.

Gonzales, R., J.F. Steiner, and M.A. Sande. 1997. Antibiotic Prescribing for Adults with Colds, Upper Respiratory Tract Infections, and Bronchitis by Ambulatory Care Physicians. *Journal of the American Medical Association*, September 17, 901–4.

Grob, D., T. Humke, and J. Dvorak. 1995. Degenerative Lumbar Spinal Stenosis. Decompression with and without Arthrodesis. *Journal of Bone and Joint Surgery, American Edition*, July, 1036–41.

Hanoch, Y., and T. Rice. 2006. Can Limiting Choice Increase Social Welfare? The Elderly and Health Insurance. *The Milbank Quarterly* 84:37–73.

Hillestad, R., J. Bigelow, A. Bower, F. Girosi, R. Meili, R. Scoville, and R. Taylor. 2005. Can Electronic Medical Record Systems Transform Healthcare? Potential Health Benefits, Savings, and Costs. *Health Affairs*, September/October, 1103–17.

Hurskainen, R., J. Teperi, P. Rissanen, A. Aalto, S. Grenman, A. Kivela, E. Kujansuu, S. Vuorma, M. Yliskoski, and J. Paavonen. 2004. Clinical Outcomes and Costs with the Levonorgestrel-Releasing Intrauterine System or Hysterectomy for Treatment of Menorrhagia: Randomized Trial 5-Year Follow-Up. *Journal of the American Medical Association*, March 24, 1456–63.

Hussey, P.S., G.F. Anderson, R. Osborn, C. Feek, V. McLaughlin, J. Millar, and A. Epstein. 2004. How Does the Quality of Care Compare in Five Countries? *Health Affairs* 23:89–99.

Institute of Medicine, Committee on Quality of Health Care in America. 1999. *To Err Is Human: Building a Safer Health System*. Washington, D.C.: National Academies Press.

Institute of Medicine, Committee on Quality of Health Care in America. 2001. *Crossing the Quality Chasm*. Washington, D.C.: National Academies Press.

Johnson, W.G., T.A. Brennan, J.P. Newhouse, L.L. Leape, A.G. Lawthers, H.H. Hiatt, and P.C. Weiler. 1992. The Economic Consequences of Medical Injuries. Implications for a No-Fault Insurance Plan. *Journal of the American Medical Association*, May 13, 2487–92.

Kahn, J.G., R. Kronick, M. Kreger, and D.N. Gans. 2005. The Cost of Health Insurance Administration in California: Estimates

for Insurers, Physicians and Hospitals. *Health Affairs* 24:1629–39.

Kaiser Family Foundation. 2007. *Medicare Spending and Financing Fact Sheet*. June. Available at http://kff.org/medicare/7305.cfm (accessed September 21, 2007).

Kaplan, B., T.L. Wandstrat, and J.R. Cunningham. 1997. Overall Cost in the Treatment of Otitis Media. *Pediatric Infectious Disease Journal* 16:S9–S11.

Kaplan, R., and M. Ong. 2007. Rationale and Public Health Implications of Changing CHD Risk Factor Definitions. *Annual Review of Public Health* 28:321–44.

Katz, J.N., S.J. Lipson, R.A. Lew, L.J. Grobler, J.N. Weinstein, G.W. Brick, A.H. Fossel, and M.H. Liang. 1997. Lumbar Laminectomy Alone or with Instrumented or Noninstrumented Arthrodesis in Degenerative Lumbar Spinal Stenosis. Patient Selection, Costs, and Surgical Outcomes. *Spine*, May 15, 1123–31.

Kim, J.J., T.C. Wright, and S.J. Goldie. 2002. Cost-Effectiveness of Alternative Triage Strategies for Atypical Squamous Cells of Undetermined Significance. *Journal of the American Medical Association* 287(18):2382–90.

Kondro, W. 2004. Canadian Report Quantifies Costs of Medical Errors. *The Lancet* 363(9426):2059.

Kontos, M.C., K.L. Schmidt, M. McCue, L.F. Rossiter, M. Jurgensen, C.S. Nicholson, R.L. Jesse, J.P. Ornato, and J.L. Tatum. 2003. A Comprehensive Strategy for the Evaluation and Triage of the Chest Pain Patient: A Cost Comparison Study. *Journal of Nuclear Cardiology* 10(3):284–90.

Kuntz, K.M., R.K. Snider, J.N. Weinstein, M.H. Pope, and J.N. Katz. 2000. Cost-Effectiveness of Fusion with and without Instrumentation for Patients with Degenerative Spondylolisthesis and Spinal Stenosis. *Spine*, May 1, 1132–39.

Levin, D., and V. Rao. 2004. Turf Wars in Radiology: The Overutilization of Imaging Resulting from Self-Referral. *Journal of the American College of Radiology* 1:169–72.

Malter, A.D., and J. Weinstein. 1996. Cost-Effectiveness of Lumbar Discectomy. *Spine*, December 15 21(24 suppl.):69S–74S.

Matthews, M. 2006. *Medicare's Hidden Administrative Costs: A Comparison of Medicare and the Private Sector*. Alexandria, Va.: Council for Affordable Health Insurance, January 10.

McGlynn, E.A., S.M. Asch, J. Adams, J. Keesey, J. Hicks, A. DeCristofaro, and E.A. Kerr. 2003. The Quality of Health Care Delivered to Adults in the United States. *New England Journal of Medicine*, June 26, 2635–45.

McKay, N.L., and C.H. Lemak. 2006. Analyzing Administrative Costs in Hospitals. *Health Care Management Review* 31:347–54.

McKinsey Global Institute. 2007. *Accounting for the Cost of Health Care in the United States*. Available at http://www.mckinsey.com/mgi/rp/healthcare/accounting_cost_healthcare.asp (accessed September 11, 2008).

Medical Group Management Association. 2005. *Position Paper: Administrative Simplification for Medical Group Practices.* June. Available at http://www.mgma.com/workarea/showcontent.aspx?id=800 (accessed September 11, 2008).

Merlis, M. 2005. *Fundamental of Underwriting in the Nongroup Health Insurance Market: Access to Coverage and Options for Reform*. Background Paper, National Health Policy Forum. Available at www.nhpf.org/pdfs_bp/BP_Underwriting_04-13-05.pdf (accessed September 11, 2008).

NCVHS Subcommittee on Standards and Security. 2005. *Hearings—Transcript of Meeting, U.S. Department of Health and Human Services, National Committee on Vital and Health Statistics, Subcommittee on Standards and Security*. April 6.

Neumann, P.J. 2004. Why Don't Americans Use Cost-Effectiveness Analysis? *American Journal of Managed Care*, May, 308–12.

Neumann, P.J., A.B. Rosen, and M.C. Weinstein. 2005. Medicare and Cost-Effectiveness Analysis. *New England Journal of Medicine*, October 6, 1516–22.

Nolte, E., and C.M. McKee. 2008. Measuring the Health of Nations: Updating an Earlier Analysis. *Health Affairs* 27(1):58–71.

Nord, E. 1999. *Cost-Value Analysis in Health Care*. Cambridge: Cambridge University Press.

Office of Technology Assessment. 1994. *International Comparisons of Administrative Costs in Health Care*. Report BP-H-135. Washington, D.C.: U.S. Government Printing Office, September.

Organisation for Economic Co-operation and Development (OECD). 2008. OECD Health Data 2008. June. Available at http://www.oecd.org/document/16/0,3343,en_2649_34631_2085200_1_1_1_1,00.html (accessed September 11, 2008).

Orszag, P.R., and P. Ellis. 2007a. Addressing Rising Health Care Costs: A View from the Congressional Budget Office. *New England Journal of Medicine* 357(18):1885–86.

Orszag, P.R., and P. Ellis. 2007b. The Challenge of Health Care Costs: A View from the Congressional Budget Office. *New England Journal of Medicine* 357:1793–95.

Pauly, M.V. 1969. A Measure of the Welfare Cost of Health Insurance. *Health Services Research* 4(4):281–92.

Pauly, M.V., and L.M. Nichols. 2002. The Nongroup Health Insurance Market: Short on Facts, Long on Opinions and Policy Disputes. *Health Affairs* Web Exclusive:w325–44.

Pham, H.H., P.B. Ginsburg, K. McKenzie, and A. Milstein. 2007. Redesigning Care Delivery in Response to a High-Performance Network: The Virginia Mason Medical Center. *Health Affairs*, July 10, Web Exclusive:w532–44.

Reinhardt, U.E., P.S. Hussey, and G.F. Anderson. 2004. US Health Care Spending in an International Context. *Health Affairs* 23:10–23.

Rice, T, J. Gabel, L. Levitt, and S. Hawkins. 2002. Workers and Their Health Plans: Free to Choose? *Health Affairs* 21:182–87.

Rothenberg, B., and A. Korn. 2005. The Opportunities and Challenges Posed by the Rapid Growth of Radiologic Imaging. *Journal of the American College of Radiology* 2:407–10.

Sack, K. 2008. Health Plan from Obama Spurs Debate. *New York Times*, July 23.

Schoenbaum, S.C. 2006. Keys to a High-Performance Health System for the United States. *Healthcare Financial Management*, July, 60–64, 66.

Sheils, J.F., G.J. Young, and R.J. Rubin. 1992. O Canada: Do We Expect Too Much from Its Health System? *Health Affairs*, spring, 8–20.

Silberner, J. 2008. Britain Weighs Social Cost of "Wonder" Drugs. *All Things Considered*, July 23. Available at http://www.npr.org/templates/story/story.php?storyId=91996282 (accessed September 11, 2008).

Society of Chest Pain Centers. 2007. *About the Society of Chest Pain Centers*. Available at http://www.scpcp.org/about/index.html (accessed September 11, 2008).

Solomon, D., N. Breen, and T. McNeel. 2007. Cervical Cancer Screening Rates in the United States and the Potential Impact of Implementation of Screening Guidelines. *CA: A Cancer Journal for Clinicians* 57:105–11.

Subcommittee on Management of Acute Otitis. 2004. Diagnosis and Management of Acute Otitis Media. *Pediatrics* 113:1451–65.

Taylor, R., A. Bower, F. Girosi, J. Bigelow, K. Fonkych, and R. Hillestad. 2005. Promoting Health Information Technology: Is There a Case for More-Aggressive Government Action? *Health Affairs* 24(5):1234–45.

Terry, K. 2004. Not Getting Paid? Blame HIPAA. *Medical Economics*, June 4, 29, 32–33, 37.

Thomas, E., D. Studdert, J. Newhouse, B. Zbar, K. Howard, E. Williams, and T. Brennan. 1999. Costs of Medical Injuries in Utah and Colorado. *Inquiry* 36:255–64.

Thorpe, K.E. 1992. Inside the Black Box of Administrative Costs. *Health Affairs* 11(2):41–55.

van de Ven, W.P., and F.T. Schut. 2008. Universal Mandatory Health Insurance in the Netherlands: A Model for the United States? *Health Affairs* 27(3):771–81.

Weber, D.O. 2006. Toyota-Style Management Drives Virginia Mason. *Physician Executive* 32(1):12–17.

Wennberg, J.E., E.S. Fisher, T.A. Stukel, and S.M. Sharp. 2004. Use of Medicare Claims Data to Monitor Provider-Specific Performance among Patients with Severe Chronic Illness. *Health Affairs* Web Exclusive. Available at http://content.healthaffairs.org/cgi/content/abstract/hlthaff.var.5 (accessed September 11, 2008).

Womack, J.P., A.P. Byrne, O.J. Flume, G.S. Kaplan, and J. Toussaint. 2005. *Going Lean in Health Care*. Boston: Institute for Healthcare Improvement.

Womack, J.P., and D.T. Jones. 2003. *Banish Waste and Create Wealth in Your Corporation*. New York: Free Press.

Woolhandler, S., T. Campbell, and D.U. Himmelstein. 2003. Costs of Health Care Administration in the United States and Canada. *New England Journal of Medicine* 349(8):768–75.

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